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Editorial

Crop Insurance: We understand from a recent press note that the Government of India are contemplating experimental crop insurance schemes under the aegis of the Central Ministry of Agriculture An officer has been appointed to study the problems involved and prepare schemes to be tried in selected areas in the Provinces Apparently, the schemes are to be modelled on the experience of the United States of America, where alone crop insurance against all risks has been tried on a nation-wide scale — first in the case of wheat, then in cotton, flax, maize and tobacco. All-risk insurance is a daring venture, not yet in vogue in European countries where insurance against particular risks like hail or windstorm is common The U. S. A Government alone has undertaken it, though not directly but through the Federal Crop Insurance Corporation, which is subsidised by the payment of expenses of administration Insurance is voluntary and the guarantee is for a percentage of the average yield of the crop on the insured farm The payment ofindemnity is limited to the difference between this percentage and the actual yield in the year Both the premium and the indemnity are payable in terms of the produce; but payments may be made in terms of cash equivalents of the produce at current market prices An ever-normal granary is sought to be maintained; the surpluses of good years, when premiums exceed indemnities paid, serve as reserves for payments in bad years.

We have no doubts as regards the benefits an all-risk insurance scheme, if properly worked, can confer on the agriculturists, who often lose heavily for no fault of their own, but due to causes beyond their control – drought, floods, cyclone, locusts or pests and diseases – which they can ward off only to a limited extent or not at all Insurance can serve to cushion the shock of total or partial failure and prevent the farmer from running into debts every time he loses It spreads the burden of loss of any one year over a period of years, and the losses of some over a large number of farmers insuring. Without such

a guarantee, the agriculturist lives in constant dread of loss and loses his morale. It is also less expensive to the Government, which has to find enormous funds for public relief during famine years and grant remissions of taxes in bad years. It preserves the self-respect of farmers who pay premiums, from out of which indemnities are given

Such a scheme is no doubt attractive on paper; but the difficulty would be to administer it. Data are not available in this country as regards the incidence of several calamities affecting crops. The estimation, even approximately, of the average yield on individual farms over a series of years and of the exact loss suffered by every individual who insures, not of the community as a whole, and above all the determination of the measure of responsibility on the part of the farmer himself for the loss would be a difficult job for any officer of the Corporation and could be undertaken only when the local leaders come forward to co-operate. But judging from the experience of the working of our Panchayats and Co-operative Societies, they might consider such work as a thankless and embarassing task. Drought in several tracts, floods in some and cyclone in others are so frequent that no private insurance agency will be tempted to take up the business. On the other hand, fairly well-protected farmers in other areas will not care to insure. The occurrence of mishaps should be occasional, not frequent, for insurance to come to the rescue. It is doubtful if the system will work, if insurance is to be voluntary, in this country. On the other hand, a compulsory scheme for all agriculturists, with premiums adjusted to the nature and degree of hazards, may succeed. It should be made obligatory on the part of all producers to take common precautions and measures, which are not costly or difficult, that are advocated by the Agricultural Department, if any scheme of insurance should succeed Being fatalists, our agriculturists give up caring for a crop, once they *feel* it is beyond recovery; such indifference may well be accentuated by an insurance scheme. They must turn over a new leaf and be ready to submit their crops to the inspection of the local committee and the touring officer of the insurance organization. A good deal of propaganda is necessary to educate indifferent farmers to a sense of duty to themselves and the prosperous farmers to a sense of their responsibility for their neighbours' welfare.

Rice Deficit in Madras and its Solution.

By

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"Food will continue to be a weapon in all efforts towards ensuring a more orderly, prosperous and peaceful country". Thus spoke Roosevelt, one of the greatest of statesmen. There is also the recent warning by the Food and Agricultural Organization that the production deficit of rice in the world would continue for the next three years. The 1947—1948 production has attained the pre-war level but this is not sufficient to keep pace with the growing world population and by 1950, the gap between production and consumption is estimated to be of the order of 14 million tons. It is our duty, as a body of workers striving to improve the food production of the country to leave no stone unturned in bridging the gap between production and the demand for food crops. Let us see what the position of rice is like in the Madras Presidency. Rice occupies about 10·7 million acres and the production for 1947—48 was 4 million tons against a normal production figure of 4·9 million tons. The annual requirements at 12 oz. ration for the total population of the province, taking the 1941 census figures, come to 5·3 million tons. The apparent deficit of 4 lakhs of tons of rice (working out to 8% of the normal production) might seem to be quite a small one but the problem of making it up is not quite so simple. In spite of strenuous attempts in the Grow-Food-Campaign it has to be admitted that the deficit is still there. This lack of success has been ascribed to various causes such as (1) the objectives being too diversified and (2) the farmer not being approached and tackled in the right manner; but, for our purpose it is only necessary to examine how far and in what directions better results could be achieved in the matter of increasing the output of rice in the country.

There are three obvious ways, namely (1) by increasing the area by bringing more land under rice cultivation (2) by enhancing the per-acre yields of the area now being cultivated and (3) by avoiding and preventing waste during the several stages of cropping and storage.

Extension of Area. In spite of all the various concessions granted by the government it has not been possible to effect any spectacular increase in the area grown under rice. It is often claimed that the extensive area which now figures as "uncultivated wastes" in Revenue records could be brought under the plough and rice grown there, but from actual experience it is known that these are not potential assets suited for growing food crops, least of all rice. If it were possible to do this, these areas would long ago have come under cultivation, considering the pressure of population and the consequent land hunger. The question

of utilising these uncultivated wastes is one that could be tackled only as a long-term programme in relation to the various dam projects, it is therefore futile to expect any immediate increase in output from these wastelands. With minor improvements, here and there, in tanks and other irrigation systems, it may be possible to convert some single crop lands into double crop lands and there by increase the output of rice to a slight extent.

Yield per acre. It is an old complaint against the Agricultural Department that the rice yields in India are very poor when compared with those from other countries in the world. But it should be remembered that in many of the countries where high yields are recorded per acre, the total rice area may not probably be even as much as in some of the individual taluks of our Presidency. Again, rice cultivation in these countries is confined to rich virgin soils. Quite apart from such factors as the chronic poverty of our cultivators, absentee landlordism, inadequate manuring and the use of soil types not all of which are particularly suited for rice, the vital climatic and ecological factors are the major points of difference between those countries and India and more particularly Madras. In countries like Spain, Italy and California the rice-growing season is restricted to the summer months with long days, favourable for greater root development and the production of larger amounts of dry matter. Incidentally it has also to be remembered that manuring is done on a much more liberal scale in those countries than in India. In the tropics the main rice-growing season is the rainy season as only then sufficient quantity of water is available for the crop. In the main growing season for rice, therefore, the sunshine available is limited both in duration and intensity, and this factor adversely affects the crop. Along with these, we have also to bear in mind the pitifully low level of manuring that is generally practised in the majority of rice-growing areas. In spite of all such handicaps, we have recorded yields of over 6,000 lbs of paddy grain per acre from fairly large areas in the Central Farm and also from the Kistna delta region. Rice crops of 100—110 days duration grown in the summer months from June to Septemper have recorded average yields of 5,000 lbs. over large areas in the Tambraparni valley in the Tirunelveli district. This takes us to the question of devoting more area to *rice growing during the summer months by providing adequate facilities for irrigation*, but such questions of policy are beside the scope or present article.

Water and Manure. In any scheme for increasing food production, the highest priority should be given to irrigation first and next to manuring. Unfortunately the Agricultural Department has no control over irrigation facilities, so the other aspect alone, namely that of manuring will be considered here. Two quick-acting and profitable manures for rice are oilcakes and ammonium sulphate, but here again we are confronted

with the handicap that the allotment of 20,000 tons of ammonium sulphate for the Madras Presidency is only a fraction of what is actually required for the needs of the province. In the case of oil-cakes too, the quantity available is less than a tenth of what is required for manuring paddy in the Province. A portion of edible oil-cakes has also to be diverted for feeding live stock. Under such limitations the only alternative is green manuring. It has been proved beyond all doubt that application of green leaf manure is a very effective method of improving paddy yield on all types of soils. Each tract has to select the green manure crops that are best suited for the tract from the various green manure crops now available. It is estimated that the area under green manure crops is about 1¼ million acres which is only one eighth of the rice area of the Presidency. Propaganda in extending the area under green manure crops has not been as fruitful of results as one would wish due to a variety of reasons, such as, for example the non-availability of green manure at the proper time, limitations of moisture in the soil and water supply for ploughing in and so on. These impediments are not however insurmountable. A quickening of the production of green manures seeds in cultivable wastes, subsidising the sale of seeds till such time as they become more popular, a nominal bonus to the growers of green manure crops, either for manuring paddy or seed production are all ways of encouraging a wider use of green manure crops. These measures have been put into action and should result before long in a considerable increase in the area under green manure crops. The growing of quick-growing trees and shrubs like Glyricidea and Calotropis on waste lands and paddy-field bunds has also been taken up, and would go a long way in providing more green leaf manure for paddy fields in due course.

Improved Varieties: Next in importance to water and manure is the substitution of unselected varieties of rice by types improved by plant breeding and selection. The total rice production in the province can be increased by not less than 10% by this method alone, if all the area is covered by improved strains. From the work done at the several rice research stations in different parts of our province nearly 150 new and improved strains have been evolved, suited to various types of soils and conditions. Some of these combine earliness, a better quality of rice and other desirable features. If the varieties now used by the cultivators are all replaced by these improved strains, by means of a well-planned and comprehensive scheme of seed multiplication and distribution, the present deficit in rice-production in the province can easily be wiped out. We have started now in Madras, such a comprehensive seed multiplication scheme, designed to cover the entire area by improved strains in the course of the next five years.

Reduction of losses Waste: That pests and diseases take a heavy toll from the potential output of this important crop both in the field and in

storage is a well-known fact. From a practical aspect it is not easy to prevent or cure any major disease under field conditions and breeding for disease-resistant types would seem to be a more promising line of attack, as it has been found that resistance to disease is a heritable character, governed by major genes in the chromosomes. How a combined attack by the plant breeder and pathologist in breeding resistance can be fruitful is evident from the two blast-resistant paddy strains, Co. 25 and Co. 26, that have been evolved for the southern districts of the Province where long-duration strains are in demand. Two resistant strains have also been evolved from the famous Molakolukulu type, suited to the blast-stricken areas of the central districts of the Presidency. Work is also being continued to breed suitable strains for other parts of the Presidency where a shorter duration is desired. The work of breeding strains resistant to other diseases like Foot-rot and Rusts has also been recently taken on hand in the Paddy Section.

With regard to the insect pests of paddy, complete life histories of all the major pests have been worked out in Madras, but the task of breeding resistant types, has not been taken up, owing chiefly to the unavailability of the elaborate insect-proof equipment and controlled conditions that are necessary for this type of study.

Mention may be made in passing about losses due to physiological causes, such as lodging of crop due to weak straw, too much shedding of grain, sterility and lack of setting, etc. but it has to be admitted that our knowledge regarding the physiology of the rice plant is meagre when compared to that available for other important crops of the world. Attempts are however being made to breed in the Paddy Section, types that are resistant to physiological factors, for example a variety from Bengal, S. R. 26 B, which is found to be fairly resistant to saline conditions is being recommended for some areas. Another variety from Maruteru MTU. 1. Akkullu, is also resistant to saline conditions. Crosses between these and other rice varieties are under way. It can be claimed that the production of higher yielding varieties by plant breeding methods is a sure and in the long run one of the least expensive methods for improving the productivity of the province. While the achievements in respect of rice are quite considerable in our Province, there is still a vast scope for further improvement. The evolution of improved types suitable for growing on marginal lands with a precarious water supply is one such item. Breeding is a continual process and the advances in knowledge in various associated fields, like Genetics, Cytology and Geobotany open up an ever-increasing and wider field for the plant breeder to broadbase his work for a successful end.

Plant diseases and their control in relation to increased crop production

By

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Introduction: The importance of plant diseases as factors responsible for limiting crop production cannot be overestimated. Crop diseases have been recorded from the earliest times and have exercised a profound influence on human affairs. In India, the losses caused by plant diseases are enormous and there is no doubt, that if adequate measures are taken to keep them in check, the level of our crop production can be considerably increased. In the year 1946, the rust disease of wheat was responsible for almost wholesale destruction of the crop throughout the country, cultivators finding it difficult to gather even enough seed for their next sowing. The blast disease of paddy which breaks out off and on in an epiphytotic scale in the districts of Tanjore, Nellore and Chittoor has been known to cause damage extending up to 70 percent in certain years.

The foot rot disease of rice which occurs in the Godavari delta and parts of Coimbatore district causes damage to the extent of 20 percent. The smut disease of sorghum occurring throughout the province reduces the yield ranging from 2 to 10 percent. Besides these major diseases mention has to be made of diseases affecting our pulse, oil seed and vegetable crops and the diseases affecting the potato crop in the Nilgiris which cause considerable damage and reduction in yield. These losses which are of sufficient magnitude to cause concern even in normal times are of enormous significance in the present crisis, when every ounce of grain produced is of value.

Plant diseases: Plants are subject to the attack of microscopic parasitic agents like fungi, and bacteria, (or virus) which invade the tissues of the plants attacked, rob them of the food materials, and cause destruction and decay. These agents are not usually visible to the naked eye, on account of their minuteness but their presence is indicated by the symptoms manifested on the host plant. These tiny organisms have the capacity of rapid multiplication and when conditions favourable for their development occur, they spread rapidly from plant to plant and cause epiphytotics.

Control Methods: In order to control plant diseases caused by parasitic organisms the first step is to understand the nature of the disease, and the peculiarities of the organisms which cause the disease. The control methods devised should be effective in killing the organism without affecting the host. It is also essential that the methods devised are such that the cost of treatment should be commensurate with the resulting

profit. A century of research in this direction has resulted in the discovery of various chemicals which can be used as fungicides, satisfying these conditions. Foremost among them, although the earliest discovered, is a solution of copper sulphate and lime in certain proportions. This solution which goes by the name of Bordeaux mixture was first discovered by Millardet in France in the last century and it is still hard to beat as a general purpose fungicide especially for the control of fungus diseases attacking the foliage of plants. In recent years a number of proprietory fungicides with copper as the base have been put in the market, but while many of them possess advantage over Bordeaux mixture in regard to convenience in handling their superiority over Boardeaux mixture in other essential respects is doubtful. Sulphur is another fungicide the use of which dates back to the last century. In recent years the discovery of the use of organo mercury compounds which can be used as seed dressing fungicides has been responsible for the effective control of a large number of seed borne diseases which have hitherto defied control by other methods. Along with investigation directed towards the use of fungicides, considerable progress has been attained in Western countries in perfecting the appliances necessary for the application of fungicides to the crops.

It is not all diseases that are amenable to control by the application of fungicides. Where the use of fungicides is either uneconomical or ineffective resort is had to the introduction of disease resistant varieties. It has been found that different varieties of crop plants react differently towards specific plant diseases and the introduction of resistant varieties have resulted in the effective control of a number of a crop diseases. A third method of control of plant diseases is by guarding against the introduction of new diseases to areas where they have not been hitherto prevalent. In many countries suitable plant quarantine laws are being enforced to prevent the introduction of new diseases.

In respect of certain diseases the only effective method of control has been found to completely destroy the affected plants, in order that the organism associated with the disease may also be destroyed and thus prevent its being spread to other plants. With a view to secure this end, suitable laws are enacted which enable the Government to enforce the eradication of diseased plants.

Besides these methods for the control of plant diseases, it goes without saying that attention should be paid to provide proper conditions for the growth and development of crops, namely, adequate water supply, balanced manuring, clean cultivation to prevent competition from weeds, provision of drainage facilities to prevent water logging, so that crop plants may be able to withstand the onslaught of diseases and pests without succumbing to them.

The control of virus diseases calls for special methods such as (1) the introduction of resistant varieties (2) the roguing out of diseased plants to eliminate sources of infection and (3) destroying the insect vectors which are responsible for the spread of the disease in the field.

Work done in South India Rice: The rice crop in South India is subject to a number of diseases, but by far the most important are (1) the blast disease caused by *Piricularia oryzæ* and (2) the foot rot disease caused by *Fusarium moniliforme*.

(1) The blast disease has been recorded from all over the province and in the districts of Tanjore, Chittoor, Nellore and Vizagapatam it is a serious factor in limiting production. The disease attacks the crop in all stages but the greatest damage is done when the disease breaks out while the crop is in the earhead stage. The damage caused by this disease is dependent on the intensity of the attack which is influenced by various factors such as (1) the susceptibility of the variety of rice grown (2) the weather conditions prevailing during the season, especially during the heading period of the crop and (3) the nitrogen status of the soil. When the disease occurs in the nursery stage it could be controlled to a certain extent by the application of Bordeaux mixture and this method is being popularised by large scale demonstrations organised for the purpose, in the districts of Nellore, Chittoor and Vizagapatam. When the disease occurs in the transplanted crop, however, this method of control is not feasible, and the introduction of resistant varieties offers the only means of preventing losses caused by the disease. The replacement of a susceptible strain with a resistant strain is no easy problem in rice. The widely divergent conditions of soil, climate, seasons, cultivation practices, duration and availability of water supply, render it necessary to have a large number of varieties suited to each tract. The evolution of a disease resistant strain is the combined task of the plant breeder and the plant pathologist, and it is gratifying to record that in the Madras Province, colloborative work of the Paddy Specialist and the Mycologist, has resulted in the evolution of a large number of disease resistant cultures which are now in readiness for distribution in the districts.

Of these, two cultures 3840 and 3912 have shown outstanding performance in regard to yield, the quality of their grain and other desirable characters when tested in various places in the districts of Trichy, Tanjore and Madura and accordingly steps have been taken by the department to multiply them in seed farm conditions. Within the space of two or three years it is hoped that enough seed of these two promising cultures will be available to replace the susceptible variety grown in the Tanjore and Nellore districts and thus effectively reduce the losses caused by blast in this area.

Work is in progress with regard to the evolution of short duration varieties which are resistant to blast to suit Chittoor and Chingleput districts.

(2) A disease of rice next in importance is the foot rot disease. The disease has been found to be seed borne, and treatment of seed with organo mercury compounds such as Ceresan and Agrosan GN at the rate of 1 gram per pound of seed has been found effective in obtaining complete control of the disease. The adoption of this method is not difficult and can easily be carried out by the cultivator himself without much effort. The cost of treatment is also not high; it amounts to less than four annas an acre.

The disease occurs in the Godavari delta and parts of Coimbatore district and it has recently been reported from Ramnad also. Arrangements have been made for stocking the fungicide in sufficient quantities in the Agricultural depots, to meet the needs of cultivators in these tracts.

Large scale demonstrations, to popularise the method were carried out in a village near Gobichettipalayam in the year 1946, 1947 and during the current season, and a quantity of seed that would cover the greater portion of the area in the whole village was treated under the auspices of the department and free of cost to the cultivator. In this demonstration the co-operation of leading ryots in the village was enlisted and it is gratifying to note that the disease has been more or less eradicated from this region. In this connection, it may be mentioned that there is considerable scope for the manufacture of these organo mercury compounds in India, and though conditions may not be propitious for the starting of such industries just, at present owing to the non-availability of mercury the future holds possibilities in this direction.

Sorghum. Next to rice Sorghum is the most important cereal crop in this province. This crop is subject to the smut disease caused by *Sphacelotheca sorghi*. The disease is carried through the seed but manifests itself only when the crop reaches maturity. It affects the grains and there is considerable loss of yield. The disease is easily controlled by treating the seed with a fungicide. In earlier years the use of copper sulphate was advocated but in recent years the use of sulphur has been adopted instead.

While the control method advocated was fairly simple and easy of adoption by the cultivator the difficulty of procuring sulphur stood in the way of the method becoming popular. In order to overcome this difficulty the department has, during the last four years arranged for the stocking of sulphur in all the Agricultural depots in the main Sorghum growing districts and a considerable area of these districts are now sown

to treated seed. It has been programmed to cover the entire Sorghum area in a few years and arrangements are under way for stocking enough sulphur to meet this requirement and reach the target.

Other crops: Fruit crops like oranges and grapes need special attention in respect of control of diseases. Systematic spraying is necessary in order to obtain maximum profits from these crops. In Wynaad taluk in Malabar, oranges are subject to a serious disease caused by *Phytophthora Sp.* which is effectively controlled by the application of Bordeaux mixture. it has been shown that the net profit from sprayed trees is about Rs. 600 per acre over unsprayed trees. In the cultivation of grape vine, the control of mildew is effected by spraying. Investigation carried out on diseases of ground nut, gingelly and potatoes has shown that all these crops will benefit by application of fungicides like Bordeaux mixture when they are attacked by fungus diseases affecting the foliage.

From the foregoing it is clear that our crop production can to a considerable extent be increased by devoting more attention to the control of plant diseases. The department has been endeavouring for the last three decades, to popularise among the cultivators remedial measures for the diseases occurring on crops and their attempts have met with a certain amount of success. But much yet remains to be done. Sprayers and fungicides are not easily available and attempts should be made to have them manufactured in India. An efficient plant protection service should be built up in the province with a view to help the ryot in taking timely measures against plant diseases. A beginning has been made in this direction and 1500 stirrup pumps converted into sprayers have been distributed to the districts as a temporary measure but these should replaced at a very early date as they are not meant for efficient and long service. Government have recently sanctioned the the appointment of a Plant-protection staff for each district. Arrangements are in progress to have each Agricultural Depot stocked with sprayers, fungicides and insecticides to meet the more urgent needs of the area served by them.

With the help of this organisation it is hoped that adequate steps would be taken to ensure that such methods of control of diseases as are known and proved to be economic are generally adopted by cultivators so that avoidable losses caused by plants diseases are eliminated.

The Food Crisis and its Solution.

By

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Insect pests of cereals, pulses, fruits and vegetables often levy a heavy toll on our food production. The ravages of insects do not stop with their destruction in the field. The stored produce, be it pulse or, grain, is equally subject to the damage and a perpetual war has, therefore to be waged against insect enemies.

The contribution of the Entomology section towards the protection of the crop in the field as well as the proper conservation of the produce in the godown consists of research and the application of the methods devised in the field.

Research: The activities under this aspect mainly have been: (1) the trial of various insecticides and chemicals against insects and (2) exploitation of the indigenous vegetable poisons for their toxic properties. In the course of investigations on the latter aspect, the remarkable insecticidal properties of the common drug — VASAMBU — *Acorus Calamus*, PONNARALI — *Thevetia nerifolia* and wild tobacco — *Lobelia excelas* were brought to light. Supplies from foreign sources, of insecticides of vegetable origin like Pyrethrum and Derris which are highly lethal to insects, but are harmless to man and other animals, were cut off owing to the war. These were made good by the establishment of large scale plantations of these plants in India. In the meanwhile, a few chemicals like D. D. T. and Gammexane were perfected as insecticides during the war and they are now available for common use. The utility, dosage and economics of these chemicals are being tested under South Indian conditions. The possibilities of other methods including mechanical, cultural and biological are also investigated.

Plant Protection: The results of research achieved in the Entomological Section are transmitted to the ryot with the help of the limited Plant Protection Staff and the Agricultural Demonstrators and a short resume of the work carried on in this line may not be out of place here. Taking the food crops, paddy ranks first in importance. This crop often suffers from a number of enemies from its seedling to the harvest stage. The more important of them are, the paddy thrips, the swarming caterpillar, the paddy grass-hopper, the rice bug and lastly rats. Cheap and practicable remedial measures, like application of insecticides, fumigants and in some cases mechanical methods like flooding, trenching are advocated and practised with success. Cholam, the next important food crop, is occasionally subject to depradations of the cholam earhead bug. D. D. T. and Gammexane dusted even in a weak concentration of of 2% have given considerable relief. Fruit crops as well as vegetables

have, among other enemies, a few species of plant lice and leaf-eating caterpillars and grubs, and these are easily controlled by timely sprayings or dustings. A more illuminating example of crop protection is by means of other parasitic insects. To mention a few, the control of the notorious, fluted scale by its predator beetle on the Nilgiris, that of the coconut caterpillar by its hymenopterous parasites in the West Coast and other Districts and of the sugarcane borer by its egg-parasite are some of the outstanding cases of success. It will be but redundant to mention here about the extermination of the obnoxious prickly pear by the cochineal insect. All these items are in progress in the districts. It is difficult to assess the results of the work in terms of money but periodical reports of the Plant Protection Staff show that millions of rupees worth of crops and produce are being saved from the depredation of insects by timely advice and help. The squad of the limited staff are always available to the ryot for advice and help regarding the control of any insect pest.

Storage of Grains: The benefits accrued by the methods mentioned in the previous paragraph may perhaps pale into insignificance, when compared with the spectacular results obtained in the storage and proper conservation of food grains.

The policy of the Central and Provincial Governments has, of late, been either to import or procure and stock enormous quantities of food-grains in spacious godowns at convenient centres. These godowns, in course of time, become the hot-beds for the prolific breeding and multiplication of the myriads of insects, which infest the grains. This contingency was not perhaps, sufficiently anticipated in its full magnitude in the earliar stages with the result, that lakhs of rupees worth of food-grains were reported to have been rendered unfit for human consumption in Bengal and the entire lot had to be condemned.

As a result of this bitter experience, the Madras Government have taken the situation seriously on hand. A special Entomological staff, consisting of four Gazetted Officers with the requisite subordinate establishment, was created and attached to the Board of Revenue with the specific purpose of safe-guarding the grains from deterioration during storage. The four Assistant Entomologists are stationed at Coimbatore, Madras, Vijayawada and Tiruchirapalli and their duties may be briefly summed up as follows :— Consignments of food-stuffs, when imported from abroad, are examined at the port of entry and necessary advice given regarding their condition and disposal. As a general policy, the godowns are first disinfested with Gammexane D-034 as a prophylactic measure. Stocks, either imported or procured locally, are stored in these godowns and if necessary the gunny-bags are given a protective layer of the above chemical to prevent any outside infestation. The stocks are kept under a careful periodical scrutiny and cases likely to get infested or having a mild infestation are recommended for either immediate release or for

disposal after reconditioning, depending upon the circumstances. On the other hand, seriously infested materials are fumigated with Calcium cyanide, which is a special technique by itself. The chemical being a deadly poison, due care is taken to see that the treated grains are free from even a trace of the Hydrocyanic acid before release. A short account of the genesis of the large-scale fumigation and conservation of food-grains may be of some interest here. By about 1943, when the food crisis was just looming large, quite an alarming report about a heavy consignment of 6,000 tons of wheat having been imported from Australia in an infested condition, was received. Prompt measures were taken to investigate the complaint and fumigation with Calcium cyanide was decided upon as the only course left open. Suitable accommodation as well as machinery for applying the fumigant were improvised with the least possible delay and it is no small achievement for the Department to have fumigated the entire stock successfully and prevented the subsequent deterioration on a scale attempted nowhere else in India till now. The Entomological staff attached to the Board of Revenue, have now taken up the inspection, disposal and treatment of the stocks as a routine measure and the Government may now well feel confident that the proper conservation of the food stocks is sufficiently assured. The following figures may give a rough picture of the enormity of the work done by this branch of food protection service from the year 1945 upto the present year .

Place	Recommended for property.	Recommended for reconditioning.	Fumigated with Calcium cyanide.	Treated with Gammexane.	Treated with Gammexane and priorities of release suggested.
	Tons.	Tons.	Tons.	Tons.	Tons.
Madras	46,000	909	12,649	8,936	65,105
Coimbatore	19,271	5,452	4,596	12,962	Nil.
Tiruchirapalli	16,502	9,492	335	17 016	Nil.
Vijayawada	19,528	5,920	2,697	1,996	Nil
Total	1,01,301	21,773	20,277	40,910	65,105

The above figures do not include the quantities that were regularly examined in the godowns every fortnight and also those that were examined at the ports of entry.

Conclusion: 1. The importance of an efficient and well-equipped plant protection service need hardly be emphasized here. 2. The Government have realised the necessity for such an organization and given effect to the proposal to depute one upper subordinate from each district for intensive training in Entomology and Mycology. Provision has also been made for equipping each District with the required amount of insecticides, fungicides and the appliances. 3. The storage section attached to the Board of Revenue has more than justified its existence and it is strongly recommended that the staff may be continued at least till the present crisis in over and the days of abundance are in sight.

The Place of Minor Elements in Growing Food Crops with Special Reference to Rice

By

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With more refined methods of chemical analysis and experimentation, a larger number of elements has been found in recent years to be essential for the healthy growth of plants than was previously supposed. Attention has also been focussed on the infertility of soils due to deficiencies of the so-called 'minor' or trace elements. Plants in general need about a dozen elements for proper growth. These may be grouped into (a) the primary major elements consisting of nitrogen, phosphorus and potassium; (b) the secondary major elements like calcium, magnesium and sulphur, and (c) minor elements consisting of iron, manganese, boron, zinc, copper and molybdenum. This last group is needed only in very low concentrations, varying from half to 400 parts per million of the nutrient solution. The terms major and minor are not to be taken as referring to the relative value of these elements to plants, since all are essential, but only as indicating the relative quantities needed by the plant. It would seem preferable to use the term "trace elements" in place of the term minor elements, as less liable to cause confusion.

Besides these twelve elements, plants have been found to contain normally, silicon, chlorine, sodium and aluminium and occasionally chromium, cobalt, iodine, lead and selenium as well, but these should be regarded more as adventitious elements that are not really essential, though some of these are claimed by certain workers to be helpful for better plant growth. These are referred to here merely to point out that they should not be confused with the essential trace elements mentioned above.

The relation of trace elements to the nutrition of the rice plant has not so far been studied in India to anything like the same extent that the primary major elements nitrogen, phosphorus and potassium have been studied. It has also been a common criticism that the average rice yields in India are very low compared to those reported from countries like Japan, Italy and Spain.

Infertility of soils due to deficiencies of trace elements is nowadays well recognised and is being studied with great attention in Western countries. During the war years field experiments were conducted in England on wheat, potatoes and broad beans as part of a programme of work on mineral deficiency sponsored by the Agricultural Research Council. The crops were sprayed with solutions containing different proportions of trace elements like *Fe*, *Mn*, *Cu*, *Zn*. and *B* and it was

found that yields were often improved to a remarkable degree by such treatments. For instance, a field of potatoes showed very distinct foliar symptoms of manganese deficiency. A closer study revealed that zinc was also deficient, and when both the elements were supplied at the same time in spray form of their salts, the yield of tubers was increased from seven tons to nearly eleven tons per acre. In Holland, a type of crop failure known as "reclamation disease" has been traced to a deficiency of copper in the soil and found to be remedied by dressings of a few pounds of copper sulphate per acre.

For Indian crops and soil conditions there is unfortunately no data which can be taken as a guide, but considering the general low level of nutrition under which nearly all our crops are raised, it seems likely that addition of trace elements might improve the yields in most localities. Where new areas are reclaimed and put under food crops as part of a general Grow-More-Food Campaign it would be found that many of the nutrient elements are in a form unavailable for the good growth of plants.

A brief account of the relationships that exist between trace elements in rice nutrition is given in the following paragraphs. Incidentally it may also be useful to touch upon the three secondary major elements viz., calcium, magnesium and sulphur in relation to rice growing, although strictly speaking, they do not come under the category of minor elements.

Calcium. The quantity of calcium that is present in the average soil is usually so large that it is very seldom that we find a soil that does not contain sufficient amounts to supply the nutritional needs of cereals, though they may be sometimes insufficient for leguminous crops. Cereals rarely take up more than 25 lb. of calcium from an acre of soil, whereas legumes take up to 100 lb. per acre. The available experimental evidence of response of rice to liming is not very definite. Small doses of slaked lime of 5 to 10 cwts. per acre appear to mobilize the available phosphorus in the soil and increase the P_2O_5 content of grain and straw, and incidentally improve also the green colour of the foliage, but the effect is too small to be of any practical use.

Magnesium. A deficiency of magnesium is seen first on the older leaves, in common with deficiency symptoms of other major elements like nitrogen, phosphorus and potassium. In all these cases, there is rapid senescence, but colour differences and other features serve to differentiate between these different elements under field conditions. On the other hand, a deficiency of calcium or sulphur in rice affects the younger leaves first, which show chlorotic symptoms. It has also been found that a deficiency of trace elements like iron, manganese or boron affects first the younger leaves of rice.

Sulphur. It is a strange but undeniable fact that although sulphur is absorbed by plants in amounts often exceeding that of phosphorus, very little is known about the relation of this element to rice nutrition. Sulphur-deficient rice plants are distinctly chlorotic. This chlorosis is liable to be confused with the paleness caused by nitrogen deficiency, but a closer examination of affected plants would show that sulphur-deficient plants have a well-marked yellowish-green colour which is more pronounced on the younger leaves whereas in nitrogen-deficient plants the older leaves are paler than the young leaves. In leaf size, tillering and plant height also, *S* deficient plants are much below normal. As the season advances these chlorotic plants turn deep green in colour and remain green at harvest time, in marked contrast to the golden colour of normal ripe plants. The yield of both grain and straw are greatly reduced in plants suffering from a lack of sulphates. Similar symptoms characteristic of *S* deficiency are observed in other crops also, such as maize, sugarcane, lucerne, tobacco and citrus trees.

Analytically, *S* deficiency in rice is associated with an accumulation of nitrogen in the grain and straw. On manuring with sulphates this abnormal nitrogen content becomes normal. Iron and manganese content also tend to be lower than normal in *S* deficient plants. Ten pounds per acre of sulphur or its equivalent weight as sulphates is sufficient to correct the symptoms characteristic of sulphur deficiency. Applications of farmyard manure are not ordinarily sufficient to correct the deficiency, where it is acute enough to manifest itself on the foliage of rice plants.

Iron. A chlorosis caused by the deficiency of iron is perhaps the best known disorder of the rice plant. The symptoms are (1) Reduction in height, leaf area, tillering and root development, (2) A marked paleness of the young leaves although the older leaves may often remain green. Rice requires iron throughout its growth period. Under greenhouse conditions iron deficiency can be easily produced either by withholding iron from the culture solution or by maintaining an alkaline reaction or by increasing the level of phosphorus when iron gets precipitated and becomes unavailable for plant growth. Under such controlled conditions, maximum growth is obtained with 32 parts of iron per million of the culture solution, though good growth is possible even with amounts as low as 8 parts per million. Below 2 p. p. m. however, iron-deficiency symptoms become apparent on the plants.

Under ordinary wetland conditions, iron chlorosis in rice is fortunately not very common, though it does occur sometimes in highly calcareous soils. This is because soluble iron is present in sufficient amounts in such waterlogged conditions, particularly when there is sufficient organic matter incorporated as green manure. When iron

deficiency actually develops, as on calcareous soils it is useless to expect to correct it by adding iron salts to the soils. Repeated sprayings with a solution of ferrous sulphate are necessary to correct the disorder. For most soils, farmyard manure or other organic manures usually suffice to prevent iron deficiency. The total iron content of a rice crop is about 1 lb. per acre, which corresponds to about 5 lb. of ferrous sulphate. An excess of iron is not known, at least so far, to be toxic to the rice crop.

Manganese. In the case of rice, both iron and manganese are needed in much larger amounts than for other crops. The two elements also form a sort of complementary pair in rice nutrition, thus an excess of soluble *Mn* leads to iron unavailability and induces iron deficiency symptoms of chlorosis. Manganese deficiency may occur in very light sandy soils as well as in calcareous soils, but not as a rule in soils that are acidic in reaction. Specific instances where this element is deficient for rice plants seem to be rare under field conditions, although the deficiency can be readily induced in pot cultures. In rice-growing, the danger is more from an excess of manganese rather than its deficiency, as the element readily goes into solution in water-logged soils and reaches toxic limits of concentrations. Under such conditions relief can be obtained by spraying the crop at frequent intervals with a solution of ferrous sulphate. Addition of iron salts to the soil is not very effective. Other means of reducing the manganese content to non-toxic limits are (1) by drying the soil before preparing the land for growing rice; (2) by the use of leguminous green manures and (3) by massive additions of calcium carbonate to the soil.

Boron. Boron deficiency in the case of rice is practically unknown under field conditions, although it has been reported in various crops, especially as a result of overliming the soil. Such lime-induced boron deficiency is believed to be due to the excessive absorption of Boron by microorganisms. In ordinary fertile soils, the available boron content is about 2 parts per million, corresponding to 5 lb. of Boron or 25 lb. of Boric acid per acre. Since the Boron content of an acre of rice is below 2 oz. *B* deficiency for rice would be most unusual.

Zinc. Zinc deficiency in rice has been reported from pot cultures but not so far under field conditions. At concentrations below 0·2 p. p. m. of zinc, the leaves of young rice plants become chlorotic and the plant becomes stunted. Rice growth is optimum at 0·8 p. p. m. of zinc and keeps good upto 2 p. p. m. but beyond that, toxic symptoms, in the form of a general chlorosis set in. A deficiency of zinc is likely to occur in leached sandy soils, and in calcareous or over-limed soils. The small amounts of zinc needed by rice soils can usually be secured by the use of town compost.

Copper. A deficiency of copper causes wilting in rice plants with marginal chlorosis of the young leaves. Grain formation is also very much impaired. For ordinary field conditions, about 25 lb. of copper sulphate per acre would seem to be a safe dose where a deficiency of this element is to be corrected, although cases have been reported where 100 to 200 lb. per acre had proved highly beneficial in increasing the grain yield in rice. Fifty to seventy-five pounds of blue vitriol are used as a remedy for die-back in orange trees in the citrus groves of California and Florida. Newly reclaimed areas, in many parts of the World have been found to be liable to produce copper deficiency in the crops grown thereon. So this has to be looked out for and avoided in our province, wherever new areas are programmed to be brought under rice cultivation.

Molybdenum. In solution cultures rice plants appeared taller and healthier when ammonium molybdate was added to supply 1 p. p. m. of molybdenum, but an absence of the element did not induce any well-marked deficiency symptoms.

Silicon. Rice, barley, maize, sunflower and red beet are the crops that have been reported to show a favourable response to added silicon, but the essentiality of this element is not yet fully established for crop growth. Sodium fluoride has been reported by some Japanese workers as inducing a stimulating effect on rice growth, at the rate of 1 oz per acre and toxic above 1 lb. per acre. Potassium iodide also stimulated growth at 0·5 oz. per acre and proved toxic above 3 oz. per acre.

Summary:

The nutrient roles of the trace elements in plant growth are briefly outlined. When new areas are reclaimed and put under food crops it is likely that many of the trace elements are in a form that is unavailable for plant growth. In the case of rice, iron and manganese are needed in larger quantities than for other crops. They form a complementary pair in rice nutrition; thus an excess of *Mn* in a soluble form, leads to the iron becoming unavailable and sets up iron deficiency symptoms. Judging from the remarkable results reported from England during the War years, of growing potatoes, wheat and other crops in newly-reclaimed waste lands it would seem worth studying the effect of spraying suitable concentrations of trace element salts on rice yields. This is an aspect that merits a fuller study in view of the importance of food crops at present and rice in particular.

Fodder Scarcity and the Possibilities of Exploiting Straw Processing in the Madras Presidency

By

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Introduction: Fodder scarcity has been a permanent factor in India, which in recent times is becoming more and more acute with the increase in population and devotion of more attention to money crops like cotton, tobacco, sugarcane etc. According to a recent census in Madras, an area of 7 million acres of cultivated land has passed over from food crops to commercial crops in the Madras Presidency in the present decade (8). As a result of the introduction of money crops and the conversion of grazing lands for cultivation, the Madras Livestock Development Officer (10) has roughly computed that the ryot is short of 50% of his grazing land and 15% of his fodder growing land.

The total number of bovines (cattle and buffaloes) in the Madras Presidency as per the census of December 1944 (14) comes to nearly 226 lakhs (vide Table I).

TABLE I.

Statement showing the number of Bovines in the Madras Presidency (culled from the census held in December 1944.)

Bovines.		Population.
I. Cattle:		
	Males over 3 years	6,942,549
	Females over 3 years	5,807,079
	Young growing stock 3 years and under	3,605,286
II. Buffaloes		
	Males over 3 years	1,179,375
	Females over 3 years	3,042,827
	Young growing stock 3 years and under	2,067,123
	Total:	22,644,239

The fodder available for this head of cattle consists mainly of straws of food grains (cereals and pulses) and fodder crops like cholam, maize, sunnhemp, lucerne, guinea grass etc. The total roughage thus obtained annually in the Madras Presidency is culled from the latest figures available and presented in Table II.

TABLE II.

Roughages available in the Madras Presidency from arable lands.

No. (I)	Crops. (II)		Normal Area sown with crops Average of 5 yrs. 1941-44, From Season & Crop Report 1944-45 (16) (III) 1000 Acres	Normal Yield of seed per acre (As found in 1919) From Season & Crop Report 1944-45 (16) (IV) lb.	Total Yield of Grain (III & IV) (V) 1000 lb.	Ratio of grain to straw (as per Wright Ref. No. 14 & Fodder Committee Ref. No. 15) (VI)	Total Production of straw (VII) 1000 lb.
	Cereals:						
1	Paddy	irrigated	7,948	1,787	14,202,183	1 : 1·5	21,303,273
2	,,	unirrigated	2,226	1,301	2,896,755	1 : 1·5	4,345,131
3	Cholam	irrigated	412	1,467	604,638	1 : 3	1,813,916
4	,,	unirrigated	4,454	577	2,570,436	1 : 3	7,711,310
5	Cumbu	irrigated	315	1,207	380,663	1 : 3	1,141,990
6	,,	unirrigated	2,322	544	1,263,309	1 : 3	3,789,928
*7	Ragi	irrigated	941	1,492	1,404,345	1 : 3·5	4,915,207
8	,,	unirrigated	782	715	558,958	1 : 3·5	1,956,354
9	Korra (tenai)		1,458	384	559,833	1 : 3·5	1,959,417
10	Varagu		948	876	830,334	1 : 3·5	2,906,169
11	Samai		567	441	250,002	1 : 3·5	875,010
12	Maize		69	1,060	73,161	1 : 3	219,483
13	Other cereals		573	(Av. Yield ½ ton of straw per acre (Vide p. 75 of Wright (14)			320,728
						Total Cereal Straws ...	53,257,930
	Pulses:						
14	Total Pulses		2,837	Av. Yield ½ ton of straw per acre (Vide p. 75 of Wright (14)			1,589,101
	Fodders:						
15	Guinea grass, maize, cowpea, lucerne etc.,		453	200 mds. of green fodder as per Fodder Committee (15)		Or taking moisture as 80%-40 mds. of dry fodder.	1,489,869
						Grand Total ...	56,336,893

Even if all this 56,337 million pounds of fodder from arable lands are apportioned off to the bovines of this Presidency, it works out to only 6·8 lb. of roughage per animal per day. But in practice part of this food is consumed by other livestock like sheep, goats, horses and ponies. And some dry straws like cumbu, ragi and the variety of cholam Thalaivirichan cholam or Konda or Montha jonna are not fed to cattle in some parts of this Presidency.

So, the actual availability is much less than 6.8 lb. roughage per head per day. But the average requirement of an animal is nearly 15 lb. of roughage per day. Working out the requirement at this rate of 15 lb. of roughage per head per day, the total annual requirement of the Presidency would amount to 123,977,208,525 lb. or 123,977 million pounds nearly. Computing the deficiency of fodder on this basis, the annual shortage in the Madras Presidency works out to (123,977–56,337) or 67,640 millions pounds. Part of this deficiency is however relieved by grasses from pastures of which no account has been taken in this computation for lack of means of estimating it accurately at present, though the Departmental forest and Panchayat forest areas, excluding the areas closed for grazing is known to afford facilities for grazing to 2¼ million head of cattle annually. Hence it is patent that there is a very heavy deficit in fodder in the Madras Presidency.

To circumvent this deficiency many recommendations and suggestions have been made in recent times by the various scientific bodies constituted to study this problem at high technical and administrative levels. Chief among them are :— (1) Increasing areas under fodder crops by a combination of persuasion, concession and compulsion on the ryots. Persuasion by propaganda, concession for growing the less remunerative fodder crops by abatement of water tax and compulsion through legislation, are possible means of effecting an increase. (2) Improving pastures by manuring and proper seeding and (3) Increasing the digestibility of the available food by processing of straws and green fodder through alkali-treatment and ensilaging respectively. This paper deals mainly with processing of straws and partly with the utilization of fodders like cumbu which are not fed to cattle in some tracts.

Processing of Straws: By processing is meant the pre-treatment of the straws before feeding it to cattle. Processing of the straws of the important cereal food crops has been studied in other countries and in recent times, it has claimed the attention of workers in India as well

Processing is aimed at improving the nutritive values and its digestible coefficient. The different nutrients like carbohydrate, proteins etc., present in the straw are partly protected by a ligno-cellulose coating and hence are not wholly available for digestion. Processing of straws therefore aims at releasing these nutrients from their protective coating.

This has been achieved in various ways by different workers. Earlier attempts have been confined to mechanical methods, like chopping, grinding or steaming under pressure. These mechanical processes scarcely improve the nutritive values, though they save energy in masticating and probably improve palatability. One has therefore to turn to chemical processes for any tangible results. Almost the first attempts under this head were those of Lehmann and Kellner (7 & 9) wherein the use of hot alkali for the pre-treatment was advocated. The process consists of soaking and boiling straw under pressure in an aqueous alkali-solution. This gave a fillip for further research and Germany faced with fodder scarcity in the 1914 war, started large-scale plants (2 & 9) to prepare straw pulp, using solutions of the alkali in weaker strengths than before. Godden (6) in 1917 followed this up in England by treating the straw with caustic soda, first in the cold and then subjecting it to hot steam treatment. This was modified by Beckmann in 1919 (3) by cutting out the heat treatment by repeated cold water washings to free the straw of the alkali.

This last process has to-day come to stay in England with the plant devised and supplied by the Imperial Chemical Industries Ltd. (1). The plant consists of two concrete basins in either of which chopped straw is treated with 1.25% alkali, the alkali is syphoned off and the straw washed with fresh water till neutral to litmus. The syphoned alkali is received in the other concrete basin, fortified to the original strength and re-used.

In India, processing has been done by Sen (11) and his co-workers at the Imperial Veterinary Research Institute, Izatnagar, practically on the same lines as Beckmann, treating straw with 8 times its weight of 1.25% caustic soda solution. The processing is done in two cement tubs, one placed lower than the other, so as to facilitate collection of the once used alkali, for a second treatment after fortifying the spent alkali with half the amount used in the first.

Food Value of the Treated Straw: The changes in food value effected by the treatment have also been considered by previous workers. Fingerling (5) found the treated straw to maintain good condition in horses when fed with a protein supplement. Even wood meal when thus treated and fed with protein supplements was found to replace hay or oats with good results. Brierem (4) also reports that milch cows and heavy stock can be well maintained with hydrolized wood meal if fed in a balanced meal.

Slade and others (12) have found digestibility to increase in wheat straw and oat straw from 13·9 to 34·3 and from 23·2 to 43·1 therms respectively. In England (13) feeding treated straw was found to be a success in 3 out of the 5 centres tried by the Ministry of Agriculture A recent work done in Cambridge (17) has aimed at preparing cellulose from

straws by the paper-manufacturing process which is merely alkali-treatment under pressure. The animal is said to relish this cellulose if fed slightly sprinkled with molasses.

Sen's work (11) in India on wheat and paddy straws has shown the following advantages to accrue by the alkali-treatment:—

(1) 16% of the original lignin present in wheat straw was removed; (2) Starch equivalent was 60% and 47% higher in treated wheat and paddy straws respectively, which affects protein saving, (3) Protein, calcium and phosphorus were assimilated to a greater extent when treated straw was fed, (4) Growth rate was doubled and (5) In paddy straw, two-thirds of the harmful potassium which causes diuresis was removed.

The process has also been tried out on a farm scale by Sen and his co-workers in Bengal and Orissa. One such attempt of Sen at Puri, Orissa Province was studied in detail by the author and this paper deals with the study made therein, compared with the trials subsequently attempted at Coimbatore and ends with the deductions drawn therefrom towards possibilities of its adoption for the Madras Presidency.

Study of the Puri Trials: The treatment of paddy straw was conducted at Puri on practically the same lines as originally designed by Beckmann (3).

The cost of setting up and working a plant for treatment was worked out as follows by the author after studying the plant at Puri:—

			Rs.	A.	P.
I. Initial Outlay:					
Chaff cutter	1	...	250	0	0
Gunny bags	24	...	12	0	0
Cement tubs	2	...	91	15	0
Drain pipes	3	...	5	0	0
Wooden ladles	2	...	1	0	0
Buckets	2	...	8	0	0
Spring Balance	1	..	8	0	0
			375	15	0
II. *Running cost* for every 480 lb. of straw treated:—					
(A) *Labour*.					
(a) Carting straw from the haystack to the chaff cutter		...	0	4	9
(b) Cutting straw in the chaff cutter		...	0	3	6
(c) Preparing the alkali and steeping the straw		...	0	10	6
(d) Washing of the treated straw		...	0	13	0
(e) Drying and stacking		...	0	7	0
			2	6	9
(B) *Materials*.					
(a) Caustic soda for 2 consecutive treatments at Rs. 25/- per cwt		...	8	0	7
(b) Groundnut oil for protecting the legs of workers		...	0	1	5
			8	2	0

Hence, for every 480 lb. of paddy straw to be treated with alkali, the running costs comes to Rs. 8—2—0 + 2—6—9 = Rs. 10—8—9. Therefore, for treating a ton of straw Rs. 48—2—0 will have to be invested apart from the initial outlay.

It was also noticed that a large amount of dry matter was lost in the Puri Trials, as only 70% of the straw was recovered after treatment, the rest having been probably dissolved out by the alkali or leached out by the subsequent washings.

Godden in England (6) reported 20% as lost in dry matter when oat straw was treated, while Sen's initial work at Izatnagar (11) records a loss of 25%, but the Puri trials gave a 30% loss in Paddy straw. If this loss is taken into account, the Rs. 48—2—0 invested in treating one ton of straw, yield only 7/10 of a ton of *treated* straw. Therefore, for every ton of *treated* straw, the running cost would amount to 10/7 of Rs. 48—2—0 = Rs. 70—5—8, which is prohibitive.

In England (1), the cost of the pre-cast concrete plant is said to cost £ 35 to 40 and the cost of processing £ 3/- per ton without taking into account the dry matter losses. But the cost of production in India is comparatively very high due to the high cost of caustic soda here. Thus the economics of the process is not favourable for its adoption.

Besides, the processing has been stated to increase the starch equivalent of the paddy straw from 24·4 to 35·9 lb. per 100 lb. of straw (11). In calculating the increase, no account has been taken of the loss of 30% of the dry matter of the paddy straw in the process. If this is allowed for, the starch equivalent has to be calculated for the resulting 70 lb. of the product. This works out to 70/100 of 35·9 = 25·13 lb. which is not far different from the original Starch Equivalent of 24·4 lb. for untreated straws. Thus the loss in dry matter besides putting up the cost of production, neutralised the increase in starch equivalent of the paddy straw from 24·4 to 35·9 lb., which is one of the main advantages claimed for the process.

Studies at Coimbatore: These studies were undertaken with a view (i) to replicate the alkali-treatment on a small scale in the locally available straws so as to minimise loss in dry matter and (ii) to find a cheaper alternative to alkali-treatment. With these objects in view the following experiments were done at Coimbatore —

(a) Alkali-treatment of Paddy, cholam and cumbu straws.
(b) Analysis of the Puri alkali-treated samples for feeding value.
(c) Composting of straw and
(d) Feeding trials.

(A) *Alkali-treatment of paddy, cholam and cumbu straws*: These straws which are locally grown were subjected to alkali-treatment on the same lines as at Izatnagar and Puri. The dry matter and ash were estimated in the treated samples. The results are presented in Table III below :—

TABLE III.

Straws treated at Coimbatore.

Trials	Date of Treatment	Treatment	Wt. taken for each Treatment	Dry wt. of treated straws	Loss in dry matter % age	Heads of analysis	
						Moisture % age	Ash (on dry basis)
			I. Cholam Straw.				
First trial	6—12—1945.	Ist.	35 lb.	23½ lb.	32·86	6·16	7·39
	7—12—1945.	IInd.	,,	27½ ,,	21.43	9 87	9·81
Duplicate trial	10—12—1945.	Ist.	,,	24 ,,	31·43	7 80	8 41
	11—12—1945.	IInd.	,,	28 ,,	20·00	6·88	8·82
			II. Paddy Straw.				
First trial	13—12—1945.	Ist.	35 lb.	30 lb.	14·29	7·20	17 86
	14—12—1945	IInd.	,,	31 ,,	11·43	7·27	19·16
Duplicate trial	18—12—1945.	Ist.	,,	30 ,,	14·29	8·01	14·49
	19—12—1945.	IInd.	,,	31 ,,	11·43	8·28	16·29
			III. Cumbu Straw.				
First trial	20—12—1945.	Ist.	35 lb.	27 lb.	22·86	6·32	10·14
	21—12—1945.	IInd.	,,	29 ,,	17 14	5 02	8 77
Duplicate trial	27—12—1945.	Ist.	,,	26½ ,,	24 29	6·99	9 50
	28—12—1945.	IInd.	,,	28½ ,,	18·57	6·42	8 63

From the data presented above, it will be evident that (i) the loss in dry matter varies with the variety of straw treated. Taking the first fresh alkali-treatment alone, the loss in dry matter comes to 32% for cholam straw, 14% for paddy straw and 24% for cumbu straw. The loss in paddy straw (viz., 14%) is very much lower than the losses reported in Izatnagar and Puri trials.

(ii) the loss in dry matter could therefore be minimised by careful handling ; and

(iii) there exists a difference between the first "fresh alkali treatment" and the second "spent and fortified alkali" treatment, as will be seen from the dry matter and ash content in both cases.

But the Izatnagar workers (9) had claimed that the first and subsequent treatments, even upto a third time, yielded a straw of the same quality as the first, as will be seen from their results below :—

Paddy straw composition after treatment with Regenerated and Recovered alkali (Izatnagar Results (11))

	First treatment.	Second treatment.	Third treatment.
1. Percentage of recovery of dry matter	74·8	76·0	76·5
2. Percentage of crude fibre	46·10	45·52	45·00

(B) *Analysis of Alkali-treated straws collected at Puri*. The author had collected samples of both treated and untreated straws from the trials conducted at Puri which were done on the same lines as in Izatnagar under the guidance of the Izatnagar workers. These were subjected to analysis for feeding values in the light of the above difference noted between the first and second treatments. The results of analysis are presented in Table IV.

TABLE IV.

Analysis of Paddy Straw samples collected at the Puri Trials.

Paddy Straw Samples	Moisture	Heads of analysis—Percentages (On oven dry basis)							
		Ash	Ether extractives	Crude Protein	Crude Fibre	Carbohydrates (by difference)	Insolubles	CaO	P_2O_5
I. Untreated Paddy Straw (Old stock)	8·808	25·45	1·07	4·94	26·37	42·17	23·92	0·16	0·16
II. Treated Paddy Straw (1st and 2nd treatments mixed lot)	7·233	15·75	1·01	4·79	37·47	40·98	13·68	0·58	0·13
III. Untreated Paddy Straw (New stock)	7·150	18·95	1·28	4·52	29·96	45·29	14·81	0·42	0·22
IV. First Treated Paddy Straw	7·331	10·67	1·18	3·61	46·48	38·06	7·48	0·63	0·18
V. Second Treated Paddy Straw	8·814	13·99	1·27	4·24	39·00	41·50	10·92	0·49	0·17

It will be seen from the figures obtained that the second treated lot with recovered regenerated alkali, differs from the first treated lot with fresh alkali and is inferior in quality to the first. Taking the crude fibre content alone the second treated lot is less by 7·5% than the first. In spite of the author meticulously following the same technique as the Izatnagar workers and though the Puri Trials were conducted under the control of Izatnagar workers, the sample of straws yielded from the first fresh alkali-treatment and the second waste alkali-treatment vary in chemical composition.

(C) *Composting of Straw*. As alkali-treatment was found to be decidedly prohibitive from the economic point of view and as the most important advantage claimed for alkali-treatment, viz., increase in starch equivalent was offset by the dry matter loss, it was sought to see whether

fermentation of the straw would pre-digest the cellulose and thereby improve the quality of the straw giving incidentally a process of lesser monetary commitment.

With this object in view cumbu straw was composted with (1) Molasses and (2) Ammonium sulphate as starters in two cement tubs (2′ x 2′ x 2′) for a period of 2 months; 50 lb. of finely cut cumbu straw with 10% of molasses by weight was packed into one tub and sealed with earth. Another 50 lb. was similarly packed and sealed with 2% Ammonium sulphate, 0·2% super and 0·4% Calcium carbonate by weight.

Samples were drawn for analysis before and after packing and after one and two months' of fermentation. The composting could not be continued longer than 2 months, as under the conditions of experimentation the bottom layers had commenced to completely rot and take on a manure-like appearance, which would have been unfit for feeding. The samples drawn were analysed for their feeding values and the results are presented in Table V.

TABLE V.

Cumbu Straw Composting Trials — Results of Analysis.

S. No.	Samples analysed with dates of sampling.	Original Moisture.	Heads of analysis on dry basis.						
			Moisture.	Ash.	Ether extractives.	Crude Proteins.	Crude Fibre.	Carbohydrates (by diffce.	Insolubles.
		%	%	%	%	%	%	%	%
1	Cumbu straw — Original sample 19—6—1946.	...	6·61	8·71	1·51	5·29	33·72	50·77	3·10
2	Cumbu straw with 10% molasses before fermentation 19—9—1946.	49·74	7·42	10·81	1·55	6·30	29·47	51·67	4·83
3	Do. after 1 month of fermentation 19—7—1946.	71·81	6·37	11·58	2·86	5·28	32·46	47·82	5·50
4	Do. after 2 months of fermentation 19—8—1946.	75·44	5·94	12·73	3·29	6·00	32·64	45·34	5·31
5	Cumbu straw with 2% Ammonium sulphate - Before fermentation 20—6—1946.	68 31	9·15	12·72	1·55	6·24	33 30	46·19	5·47
6	Do. after 1 month of fermentation 20—7—1946	74·23	7·65	13·38	1·60	6·31	32·47	46·24	5·34
7	Do. after 2 months of fermentation 20—8—1946.	75·51	6·44	12·51	1·06	6·03	35·29	45·11	4·54

It will be seen from the results obtained that composting for 2 months had not materially improved its feeding values, though the products obtained at the end of 2 months of fermentation had a good silage-like appearance and smell.

The main object of the treatment, namely the increase in the total carbohydrate moeity (crude fibre and carbohydrate) remained unaffected. There was however some perceptible difference in ash and ether extractives, but the other values remained practically unchanged.

(D) *Feeding Trials* · As the alkali-treatment was prohibitively high in cost and as the composting tried out as an alternative measure did not tend to improve the feeding values of the straw, processing of the straws normally fed to cattle was given up and only straws like cumbu which were not normally fed to cattle in tracts like Coimbatore, were considered for processing. These latter straws had to be made palatable as otherwise they were wholly lost as a fodder to the Presidency. With this object in view the feeding trials were undertaken with cumbu straw treated and untreated.

(i) *Feeding of Treated Straw:* Alkali-treated cumbu straw was fed to two animals at the Central Farm, Coimbatore, to see whether the animals would eat treated cumbu straw. As a preliminary measure the animals were fed for 3 days only and though they did not take to it on the first day, yet within a short span of 2 days they consumed the straw wholly without any deleterious effect.

(ii) *Feeding of Untreated Straw:* Before attempting any large scale treatment of the unpalatable straw like cumbu, for incorporating it in the regular feed of the animal, information was sought as to whether feeding of the straw as such without treatment would be possible and if prolonged feeding would cause any deleterious effect on the animal.

If no deleterious effect was produced and if the animals were to take to it without any special treatment, then the 4,931 million pounds of cumbu straw annually produced in the Madras Presidency and not utilised as fodder in places like Coimbatore and other places adjoining hills, could be used as fodder instead of as thatching material. This would go a great way to relieve the fodder scarcity of the Province.

With this object in view a controlled feeding experiment with 4 work bullocks was started at Coimbatore at the Central Farm in collaboration with the Superintendent, Central Farm. The experiment lasted for 4 months. Two animals were kept as controls and two as experimentals. The two controls received the normal farm rations, consisting of 20 lb. of roughage, 1 oz. of mineral mixture, 1 oz. of salt and 1 to 3 lb. of concentrates depending on the work. The two experimental animals were also fed the same rations with 25% of cumbu straw substituted in the roughage usually fed. The proportion of cumbu straw in the roughage was gradually increased and brought on wholly to cumbu straw in the course of 6 weeks for the experimental animals. Weekly live weights were recorded.

It was seen that the liveweight was not affected by the feeding. The health and condition of the animal did not in any way deteriorate due to cumbu straw feeding. It could therefore be concluded from the preliminary trials so far conducted, that the antipathy against cumbu straw feeding is not borne out by controlled feeding and no special treatment may be needed to incorporate it in the feed.

Discussions and Conclusions: The studies made at Puri and later followed up in Coimbatore revealed that processing with alkali was not an economical proposition. Nor would the cheaper alternative of composting tried out, help in giving a better quality straw. The high cost of soda which mitigates against the alkali-treatment, it is hoped will come down in normal times and the processing cheapened to that extent and possibly come within the means of the proverbially poor Indian ryot. For, it cannot be gainsaid that alkali-treatment bestows certain improved qualities to the straw, which would offset the prevalent fodder scarcity by making the available fodder better digested and utilised by the animal.

Coming to the question of fodder scarcity, as mentioned at the outset there are certain varieties of straws and fodders, which are not fed to cattle in some tracts particularly adjoining the hills. Some of these straws are the cumbu straw as mentioned before, Konda or montha jonna or Thalaivirichan cholam, dry ragi and dry tenai straws. These if fed to cattle would alleviate the fodder scarcity to a certain extent. Some of these, like cumbu straw could be even incorporated without treatment as was shown by the feeding trial. But for some of the others, treatment may be necessary. For these, alkali-treatment could be adopted irrespective of the cost, if the treatment is going to make these straws palatable to the animal and to a great extent swell the available fodders of the Presidency.

But for other fodders which are relished by the animal and which are usually fed to the cattle, processing does not compensate the monetary drain on the cattle husbandman.

It should however be pointed out that this is only a preliminary investigation and more information will have to be gathered before any definite conclusion could be drawn.

Summary:

1. The annual deficit in fodder in the Madras Presidency is worked out as 67,640 million pounds.

2. To circumvent this deficiency processing of straws is discussed to make the available fodder better utilised in the animal system.

3. Alkali-treatment is considered as the chief means of processing but is economically not paying.

4. Composting of straws tried out as an alternative does not materially change its feeding value and is therefore not worth attempting.

5. Certain straws like cumbu and some varieties of cholam like Thalaivirichan cholam etc., are not fed to cattle in some tracts of the Presidency. These, it is tentatively concluded, should be processed irrespective of the cost, to relieve the fodder scarcity of the Province, if they could not be directly incorporated by a judicious admixture with other straws as is shown in the case of cumbu.

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A Note on J.75 (Fodder Sorghum) of the Agricultural Research Station, Guntur.

By

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Introduction: Ongole in Guntur District is the centre of the Ongole breed of cattle. The breeding tract of this type extends to the dry Taluks of Ongole, Bapatla, Narasaraopeta, Guntur and Vinukonda of the Guntur District and Darsi and Kandukur of Nellore District. The soils in these taluks are mostly heavy black soils, where sorghum grows well, yielding a good cattle feed. The hardiness and strong bony structure found in the Ongole breed is said to be due to sorghum fodder and abundant lime in the soils of Guntur. Ryots of this tract take much care in cattle-breeding and a fourth of their holding is usually left as pasture for cattle grazing, in addition to putting a good proportion of the cultivated area under fodder crops. With the increase in population, conditions have changed at present, and the grazing areas have been brought under the plough and converted into cultivated lands; thus the private grazing areas are reduced. In the case of cultivated lands, in spite of giving a prominent place to commercial crops like tobacco, chillies etc., ryots do take even now great care of their cattle and grow enough fodder crops for maintaining them in good condition. Of the total area of 4,21,090 acres under fodder crops normally grown in the province, 1,81,600 acres (or 43% of the total area) are in the Guntur and Kistna Districts.

Sorghum as a fodder crop: Among the fodders grown in the tract Sorghum is the most important. The cultivation of fodder sorghum as a rainfed crop is a common practice in the Guntur and Kistna Districts. The crop is grown during to early (May—September) season taking advantage of the south-west monsoon. During the growing period of the crop, about 20" of rain are received, distributed over 40—50 rainy days and this fair distribution of rainfall facilitates the successful cultivation of the crop in drylands. The variety of jonna used for fodder crops is known as "*Pedda Jonna*" (long-duration variety as against "Gidda Jonna", a short duration one grown in the same season). The peculiarity of this "*Pedda Jonna*" is that its duration extends to 4½ to 5 months when sown in the early season, with a luxuriant vegetative growth, while the grain-set is poor; when the same variety is grown in the main season (*Pedda panta*, August—December) its duration is 4—4½ months and the grain set is fair, while in the late (Pyru, November—February) season, the duration of the variety is reduced to 3½ months and the grain-set is very good.

So the common practice by the ryot is to sow this variety early in the month of June (Mrugasira Karthi) for a fodder crop quite in advance of the usual main grain-crop season (August—December) and encourage its vegetative growth so as to have good out-turn of fodder. It is sown in seed drills (gorru) as a mixture with "Pillipesara" (Phaseolus trilobatus) using a seed rate of 40 to 50 pounds. Helped by rains, the crop comes up well. It is harvested when flowering is completed and the grain is in the dough-stage, since the popular belief is that it deteriorates in quality and does not stand stacking when harvested earlier. After harvest it is bundled and stooked till it is completely dry and finally stacked for use through the year. The yields of dry hay vary from 5,000 to 8,000 pounds per acre.

The "*Pedda Jonna*" variety is a quick-growing and well-tillering plant and gives good yields of fodder but the quality of the same is poor since it is a type with white mid-ribbed leaf and pithy stalk. Among sorghums, these types, with dull mid-ribs are associated with juiciness and among them those that have sweet stalks are good for fodder, compared to types with white mid-ribs and pithy non-sweet stalks. Attempts to replace this local type with reputed fodder types of other stations were made and the results of these trials are summarised in this paper.

Introduction of fodder types of other places: The popular variety grown for fodder purposes in Coimbatore is "Periamanjal Cholam". The variety was tried at Guntur to study its suitability for the tract, during the years 1926—29 along with "Ongole, and Local" varieties. The results are as below:

Varieties.	Yields of dry fodder in pounds per acre.		
	1926—27	1927—28	1928—29
1. Periamanjal	4,061	3,285	2,800
2. Ongole	3,163	2,835	discarded
3. Local	3,487	2,972	2,550

"Ongole variety" gave low yields and was discarded in the third year. Periamanjal was best in yield but it was lacking in quality. So, later, dull midribbed, juicy and sweet-stalked varieties from Hagari and Nandyal were tried. T. 1 and T. 12 of Hagari, N. 124, N. 159, N. 20/10 and N 28/3 of Nandyal were compared along with maize, Teosinte and "Irungu" cholam during the years 1936—39. The trial showed that N. 23/10 and N. 124 were on a par with "local" in yield while the Hagari varieties were poorer than the local type.

SUMMARY OF RESULTS.

Varieties.	Yield of fodder in pounds per acre.		
	1936—37	1937—38	1938—39
1. N. 23/10	5,933	29,100	32,600
2. Local	6,700	28,810	20,017
3. N. 124	6,466	25,700	21,433
4. N. 28/3	5,566	27,500	17,433
5. N. 159	6,700	24,360	16,633
6. Irungu	4,600	21,980	15,317
7. T. 1	5,217	20,460	20,950
8. T. 12	4,400	21,110	15,133
9. Maize	1,566	10,610	11,783
10. Teosinte	3,417	6,970	7,167
Critical difference	1,210	4,104	2,140

Conclusions:

1936—37: 2, 5, 3, 1, 4, 7, 6, 8, 10, 9

1937—38: 1, 2, 4, 3, 5, 6, 8, 7, 9, 10

1938—39: 1, 3, 2, 4, 5, 6, 8, 9, 7, 10

Thus no variety was found good enough to replace the "Local" as yields were not high when quality was present and quality was lacking when yield was satisfactory.

Selection work on the station: In consideration of the importance of fodder types of the tract, selection work was started for evolving fodder types in jonna simultaneously with grain types. J. 75 is a promising grain variety with white midrib, pithy and non-sweet stalk. In 1936—37, in a population of this grain type, a few dull-midribbed plants were noticed. The proportion of these dull-midribbed plants was very low (0·05%) and definitely these off-types did not arise by segregation. These dull-midribbed plants were kept under observation and they were found to resemble the rest of the population in every respect excepting in mid-rib colour and sweetness of stalk. These were expected to prove good progenitors of a superior fodder type. As such these were separated and given numbers from J. 1265 to J. 1301 for studying their behaviour in the subsequent seasons with the object of isolating a good fodder strain. Three of the promising selections were compared with "local", "Pedda jonna bulk" for yield of fodder, during 1939—40 and 1940—41 and the results are summarised below.

Varieties.	Yield of fodder in pounds per acre.	
	1939—40	1940—41
1. J. 1289	21,164	10,049
2. J. 1279	21,150	10,073
3. J. 1281	20,044	10,245
4. Local	16,064	9,003
Critical difference	1,645	1,000
Conclusion.	1, 2, 3, 4	3, 2, 1, 4

All the selections gave significantly higher yields than "Local" but the differences in yield among the selections were not significant. A mixture of these dull midribbed, sweet and juicy stalked selections was made since they did not differ either morphologically or in yield and under the name J. 75 (fodder type) the seed has been under distribution for purposes of fodder cultivation. Since this J. 75 (fodder type) seed had its orgin from J. 75, the pyru jonna strain, the former can be used for growing a fodder crop in the early season and a grain crop in the main and late seasons in the same way as the ryots do with "Pedda" jonna. Thus the long-felt want for a fodder type of high quality, to replace the "Local Pedda Jonna" type was satisfied by the isolation of J. 75 (fodder type).

Summary.

(i) Cultivation of fodder crops in a cattle breeding tract is a vital necessity and in the Ongole tract sorghum fodder is much valued, being grown on an extensive scale under rainfed conditions.

(ii) The variety of sorghum used for fodder cultivation is one popularly known as "Pedda Jonna". Though a quick-growing and high-yielding variety, it lacks quality, since it is a white-midrib variety, with pithy and non-sweet stalk.

(iii) Attempts made to replace the local type by suitable fodder types of other places were not successful, since the yield was poor when quality was good and quality was poor when yield was satisfactory.

(iv) Selection work at the Agricultural Research Station, Guntur, for fodder types resulted in securing sweet-stalked mutants from J. 75, a grain type of late (pyru) season, and these mutants gave better yields of good quality fodder than the local *Pedda Jonna*. A mixture of these mutants under the name of J. 75 (fodder types) is given out for distribution in the district. This fodder type can be used for growing a fodder crop in the "Early" season and a grain crop in the late (pyru) season, just like "Pedda Jonna" and can thus replace the later type completely.

Note on Trials on Jonna (Jowar) Seed Varieties

By

* K. SANKARAIAH

Bhavani Farm, Thumadu, Kandukur Taluk, Nellore District

In my attempts to select the best strains of seeds in respect of crops I grow, Jonna was given prominence as the crop is the main food crop of drylands both for men and cattle. Here, for grain and fodder it is a *pairu* crop (*Rabi*) sown in November and a green fodder crop in *Mudura* (*Kharif*) season sown in July or August soon after the South-west monsoon breaks. In this tract the yellow-grained variety is very popular and the white-grained variety is only rarely grown. I feel the need of publishing my field records in support of my conclusions. Trial plots were taken up from a big block so that landslope, level of fertility and cultural operations might not vary. Soils of medium fertility were selected and the seed rate was the same for all strains. Observations and results were recorded without favour or prejudice.

Yellow-grained Jowar: The first trial was in the year 1940—41. This year T. 6, an improved strain of the Nandyal Research Station was compared with two local strains pairu jonna or pairu Pacha and Muduru Jonna. The results were as under, showing that T. 6 stood first.

S. No.	Strain	Date of Sowing	Date of Harvest	Extent of trial land	Yield of the trial plot Grain	Yield of the trial plot Fodder	Yield per acre Grain	Yield per acre Fodder	Rank
1	Pairu (Local)	22-11-1940	18-3-1941	0 50 acre	292	1086	584	2172	II
2	Muduru (Local)	,,	,,	,,	128	756	256	1512	III
3	T 6	,,	14-3-1941	,,	144	1200	888	2400	I

1944—45: This year the trial plot for each strain measured 17 cents, and for the sake of greater accuracy three plots, each measuring one cent, were cut for harvest Two local strains, two best strains of Guntur and three best strains of Nandyal Research Station were taken for trial. These two Research Stations being in the adjacent districts and there being no Research station in this district for dry crops, local strains were taken up. The results were as under. The plots were sown on 14—11—1944 and harvested on 22—2—1945 except the two local strains which were harvested later, on 8—3—1945.

H = Date of harvest, G = Grain, F = Fodder. All figures denote weight in pounds.

* Mr. K. Sankaraiah is an enlightened Agriculturist who is keen on improvements. (Editor, M. A. J.).

S. No.	Area of plot	Local (Muduru)		Local (Pairu)		G. J. 75		G. J. 103		N. 29/68		N. 28/3		T. 6	
		G	F	G	F	G	F	G	F	G	F	G	F	G	F
1	1 cent	5	13	8	31	8	21	10	21	12	44	6·0	30	12	42
2	,,	9	15	8	31	7	20	10	25	9.5	40	7·5	24	16	38
3	,,	9	23	8	28	7	15	7	26	4.5	18	4·5	12	7	25
Total yield		23	51	24	90	22	56	27	62	26	102	18	66	35	105
Average yield in a cent		7·7	17	8	30	7·3	18·7	9	20·7	8·7	34	6	22	11·7	35
Yield per acre		770	1700	800	3000	730	1870	900	2070	870	3400	600	2200	1170	3500
Value @ 10 lb. grain and 1 cwt. fodder per Rupee		77+15-3 = Rs. 92—3—0		80+26-3 = Rs. 106-13—0		73+16-11 = Rs. 89-11—0		90+18-8 = Rs 108-8—0		87+30-6 = Rs. 117—6—0		60+19-11 = Rs. 79-11—0		117+31-4 = Rs. 148—4—0	
Rank		V		IV		VI		III		II		VII		I	

1946—47: From the results it is obvious that T. 6 scored the first rank and N. 29/68 now known as N. 1 stood second. With a view to confirm this result I compared these two varieties, when T. 6 yielded 18 lb. of more grain than N. 29/68. The Agriculture Demonstrator of the adjacent taluk, Kavali, found in his observations that N. 29/68 yielded better than T. 6, so for final confirmation trials were resumed in 1947—48. Another observation worthy of mention is that though the Guntur Research Station is nearer than Nandyal Research Station, to my farm, Guntur strains G. J. 75 and 103 did not fare better than the Nandyal strains N. 29/68, N. 28/3 and T. 6. Apart from the above, G. J. 916 of Guntur Research Station producing red grain was tried which yielded 500 lb. grain and 1,360 lb. fodder per acre. For red grain there is no good market. A variety from the same Research Station viz., G. J. 869 was tried and the result was 400 lb. grain and only 560 lb. fodder per acre.

1947—48: Whether it was T. 6 or N 29/68 (N. 1) both were produced in Nandyal Research Station and so I got two more strains of the Research Station viz., N. 4 and N. 294 besides N. 29/68 (N. 1) and T. 6. These four improved strains were compared with a local variety and the results were as under.

G = Grain, F = Fodder and figures against them denote weights in pounds and ounces.

S. No.	Area of Plot	N. 4		N. 294		T. 6		N. 1		Local pairu pacha	
		F.	G.	F.	G.	F.	G.	F.	G.	F.	G.
1	One Cent.	25 0	4·4	37·0	5·8	22·0	6 0	41 0	5 8	22·0	6·5
2	,,	35 0	5·8	45·0	5·8	16·0	6 0	46·0	7·8	20·0	7·0
3	,,	23.0	3·8	24 0	3 8	18 0	5·8	38·0	6·8	19·0	5·0
	Total ...	83·0	13 4	106 0	14·8	56 0	17 8	125·0	19 8	61·0	18·5
Average for a Cent ...		27·6	4·7	35·5	4·13	18·11	5·13	41·11	6·8	20·5	6·2
Yield per acre ...		2770	444	3530	481	1870	581	4170	650	2030	613

	Rs. a.	Rs. a.	Rs. a	Rs. a.	Rs. a.
Cash value at 10 lb.	24—12 plus	31—8 plus	16—12 plus	37—4 plus	18—2 plus
Grain and 1 cwt.	44—6 =	48—2 =	58—2 =	65—0 =	61—5 =
fodder per rupee ...	9—2—0	79—10—0	74—14—0	102—4—0	79—7—0
Rank ...	V	II	IV	I	III

It is obvious from the above results that N. 1 stands first, while N. 294 and the local variety stand almost on a par. The value of grain and fodder are both taken into account in view of their equal utility. Fodder is valued at 1 Cwt. and Grain @ 10 lb. per rupee, at fair market rates. The results indicate that N. 1 scored the first rank with a difference of about Rs. 23/- per acre and it excels the local strain or N. 294 that stood second by 22%. N. 294 is said to be a selection from T. 6. Previously it was observed by me that acclimatized T. 6 proved inferior to seeds freshly imported from the Research Station. This is said to be due to hybridization resulting from contact with various local types grown in the near surroundings. The deterioration was marked, as was observed by me in 1942—43 and the observations were as under.

	Grain lb.	Fodder lb.
1. Local Jonna	437	2256 per acre.
2. Acclimatized T. 6	490	1560 ,,
3. Freshly imported T. 6 (From Nandyal Research Station)	770	3240 ,,

In three generations T. 6 deteriorated almost to the level of the local type. When compared to the crop grown with fresh seeds, the fresh one yielded roughly 60% over either the local or the hybridized T. 6.

Suggestions: In view of my experiences on the performances of improved types of Jonna, I would offer the following suggestions for further development.

(1) Improved strains of a particular Research Station will benefit the tract similar to the locality of the Station in respect of soil type, fertility, climatic conditions, distribution of rain, cultural operations etc.,

The fact that though Ongole tract is nearer to Guntur than Nandyal, the strains of Nandyal Research Station proved better in Ongole area shows the importance of the above factors in plant breeding, It is the popular opinion that the region within the Gundlakamma river in the North, Bay of Bengal in the east, River Paleru in the south and Eastern Ghats in the west is similar in all natural aspects pertaining to men, cattle and crops. This is said to be the home for Ongole breed of cattle. If such regions are marked for agricultural purposes irrespective of other considerations, every region is sure to promote its economic interest to a marked degree in no time.

(2) In view of the fact that local seed is a mixture of many varieties and still capable of yielding on par with the improved strains in certain years, it will be a great service if good selections are made from among the local types of a region in that region alone instead of making a selection from the masses of one region growing in another region of different environment. Improving such selections and keeping them genetically pure should always be in the hands of the Regional Research Station to prevent variability.

(3) No doubt, the scientist is capable of producing better strains by hybridization. In view of the fact that hybrids lose vigour gradually, the scientists' selection on pure lines should be done by the Regional Research Station and multiplication of seed should be carried on separately in isolated farms to meet the public demand.

(4) .As hybridization goes on in nature the only remedy to prevent it is that all should grow the same strain. Whether this can be done by propoganda or by legislation is a difficult problem.

Whatever may be the obstacles, the need to alleviate the present food crisis warrants speedy enforcement of the decisions of the scientists and extend to every nook and corner the benefits of good seed.

My thanks are due to Mr. V. Kumaraswamy who as the Agricultural Demonstrator, Kandukur, put me in the way of seed selection for my requirements.

11th ALL INDIA BEE-KEEPERS' CONFERENCE.

Sri H. Viswanathan, Bee Expert and Honorary Secretary, All India Bee-Keepers' Association, Bombay General, writes to us that the 11th All India Bee-Keepers' Conference and Bee Exhibition (1949) will be held at Sri Gandhi Gram, Nandgad (Belgaum District) from 29th April 1949 to 1st May 1949. He seeks the co-operation of all the Bee-Keepers, and those interested in apiculture, in the holding of the Conference and Exhibition.

Research Notes.

A short account of the trials regarding the amount of Carbon Dioxide respired by Cholam grain (Fresh grain and grain infested with insects)*

Fresh grains as well as those infested by a known number of insects were kept under observation and the quantity of $Co._2$ evolved under the different conditions recorded. The object of the trials was to see whether there is any variations in the amount of $Co._2$ respired in the different lots and whether these variations could be correlated with the degree of infestation and population in the grain.

Method: A definite quantity of grain with and without the insects was packed to the maximum capacity in conical flasks. In the trials with the insects 100 and 200 specimens of *Sitophilus (Calandra) oryzae*, *Tripolium castaneum* and *Rhizopertha dominica* were introduced separately and the $Co._2$ estimated. The flasks were then closed securely with rubber corks having two tubes one short and the other long both bent at right angles at the top. The ends of the two tubes were closed soon after filling and kept for 24 hours. The $Co._2$ evolved was estimated after 24 hours by the absorption of the gas in standard barium hydroxide and titrating the excess of alkali with standard oxalic acid. A rough sketch of the apparatus is given in the figure.

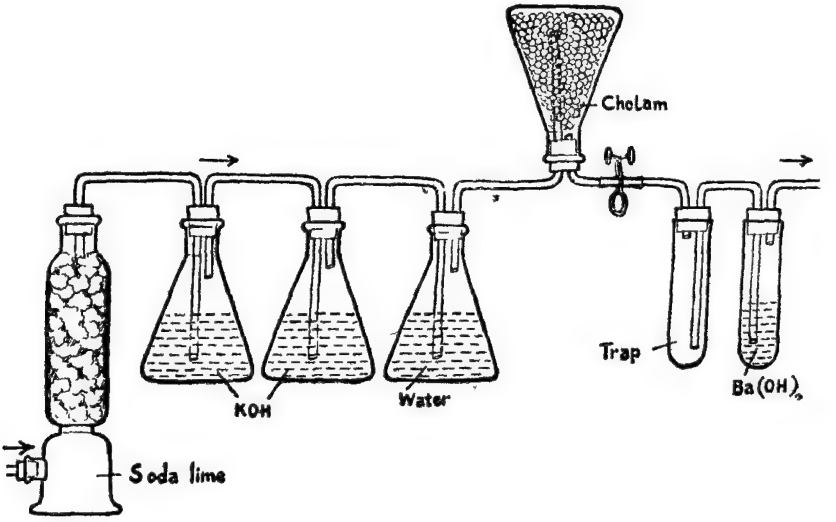
Details regarding the quantity of $Co._2$ evolved under different conditions are furnished in the following statement:

No.	Treatments.	Wt. of Co.2 evolved by cholam alone.	Wt. of Co 2 evolved by cholam † insects.	Wt. of Co.2 evolved by insects alone.
1.	One lb. of Cholom	1·54 gms.	...	...
2.	One lb. of Cholam † 100 *Sitophilus* (*Calandra oryzae*)	...	7 92 gms.	6·38 gms.
3.	One lb. of Cholam † 200 *Sitophilus* (*Calandra oryzae*)	...	15 18 gms.	13 64 gms.
4.	One lp of Cholam † 100 *Tribolium castanoum*	...	8 096 gms.	6·556 gms.
5.	One lb of Cholam † 200 *Tribolium castaneum*	...	14·96 gms.	13·42 gms.
6.	One lb of Cholam † 100 *Rhizopertha dominica*	...	8·636 gms.	6 996 gms
7.	One lb. of Cholam † 200 *Rhizopertha dominica*	...	15·4 gms,	13·86 gms.

* A contribution from Government Entomologist, Coimbatore.

Conclusions. 1. The infested grain evolves more $Co._2$ than healthy grain the additional quantity being that respired by the insects. 2. The additional quantity is appreciable and is proportionate to the insect population. 3. No striking variations are noticeable in the quantities of Co. 2 evolved by the different species of insects.

The above experiments were conducted with the kind help of Government Agricultural Chemist in his laboratories by Assistant Miss G. P. Janaki.



D. D. T. SPOILS TOBACCO.

Australian tobacco growers hailed the appearance of D. D. T. as the final solution of many of their problems. It afforded tobacco plants more complete protection than any other insecticide in general use, and was easy and reasonably inexpensive to use. It has been disappointing to discover from the reports of Government field officers that the D. D. T. has a harmful effect on the tobacco, as leaves that have been treated with the insecticide remain too damp for manufacture into cigarettes. According to one report, cigarettes made with such leaf would not even smoke. The problem will probably be referred to the Council for Scientific and Industrial Research for investigation. If reports received are confirmed, it will be necessary to find some harmless but equally effective insecticide, or to develop some means of neutralising the effect on the leaf of D. D. T, so that it may still be used.

— (Agricultural News letter, A. G. N./211).

Correspondence

The New Era Cowpea — Note by R. M. Savur, Y. R. Farm, Nileshwar Post.

It is a great pity that on the West Coast, where the dearth of good fodder for cattle is acute, the value of the cowpea plant is not properly appreciated. In those parts of America where for climatic or other reasons lucerne and clover cannot be grown, one of the substitutes most largely grown for fodder and green manure, is one or other of several varieties of cowpea. I have read in the "Australian Fruit world and market grower" that similarly, in certain parts of Australia the Cowpea is extensively grown and that the variety most favoured, because of its "bush" habit is some variety which (according to the magazine) is called "The Poona Cowpea" in Australia. Whether this is the same as the "New Era" variety. I do not know. Neither do I know the origin of the "New Era" variety. I first cultivated on a kitchen garden scale the New Era Cow-Pea (of which I obtained seeds from P. P. Pocha of Poona) in the 1943 season when I started farming. I collected my own seed and again grew some in 1944. But in this second year my fieldrats discovered its value as food and did not allow one single pod to ripen. Owing to war conditions I could not obtain any seed till 1947 when Mr. K. Hanumantha Rao gave me half a pound of seed when I visited the Kankanady Station.

It was during this (1947) season that I learnt to appreciate the great value of this crop. Owing to its non-vining bush habit it requires no staking and is well adopted to cultivation on a field scale. Its pods are held erect above the leafy growth — which simplifies harvesting of pods. It is a rapid grower and produces a great deal of green leaf, it is a very prolific bearer, commencing early bearing over a long period. Its root development is good and the roots have plenty of nodules of large size Both the tender pods and developed seeds are good for curries. The short pods have numerous seeds. Needless to say cattle relish it. Thus we have a plant with a triple purpose — Food for man, cattle and the soil.

I can give no figures of yields for I neither weighed nor measured what we used up. But I can give some facts from which conclusions may be drawn. By 1947 Government had brought its system of control to such perfection that neither Toor-Dhall nor any pulses were available in the market. For well over two months for a household of four we used cowpea pods and cowpeas for the staple curry, twice a day. In addition I fed a flock of nearly 50 fowls with minced pods and gave an occasional mouthful to four pet calves. Finally I was still able to collect 7 seers (S. Kanara measures of capacity) of dried seed for the next season. All this from half a pound of seed obtained from the A.R.S. Mangalore.

The last but most important virtue of this cowpea is that Dhall made from it differs but little from the best Toor-Dhall either in taste, flavour or cooking quality. Owing to the complete absence of Toor-Dhall in the market I converted two out of the seven seers of seed into Dhall. Both myself and others who tasted curries made of this dhall could note little difference between this and the best Toor-Dhall in flavour or taste.

Consider the following facts:—

1. Prolific and early bearing
2. Its being a substitute for Toor-Dhall indistinguishable from it and the fact that this district has to depend entirely on imported Toor-Dhall.
3. Its fodder value – both green and as hay
4. The manurial value of its roots
5. Its ease of cultivation on account of its non-vining habit.
6. Tender pods can be cooked also as the pods contain numerous seeds, the variety can be grown for grain unlike other varieties which are useful only in the tender pod stage.
7. The fact that it can be grown at all seasons of the year.

For all the above reasons I believe the New Era variety of Cowpea deserves the special attention of all cultivators and in particular of cultivators of poor soils.

Extracts

Butter Factory Over-Run. Over-Run is defined as the amount by which the quantity of butter actually manufactured by a factory exceeds the quantity estimated on the butter-fat content of the cream received.

When the supplier's cream is received at the factory it is weighed and tested for butter-fat content and the quantity of commercial butter which can be manufactured from it is calculated by means of the chart designed for the purpose. The figure thus obtained is used as the basis of payment for the cream. Weighing and testing indicate the amount of butter-fat actually contained in the cream, but since in addition to butter-fat, butter also contains water, salt, and a small quantity of milk curd, the actual quantity of commercial butter which can be manufactured from a given quantity of cream is considerably more than the amount of butter-fat it contains. The chart is simply a table showing the quantity of butter which can be made when the butter contains an average amount of water, salt, and curd and it obviates the necessity for making involved calculations Extracts from these "Butter Computing Tables as they are called are given below for purposes of illustration

40 per cent cream test		42 per cent cream test		43 per cent cream test	
Cream Lb.	Commercial Butter Lb	Cream Lb.	Commercial Butter Lb.	Cream Lb.	Commercial Butter Lb
40	19·560	40	20·5680	40	21·0720
45	22·005	45	23·1390	45	23·7060
50	24·450	50	25·7100	50	26·3400
100	48,900	100	51·4200	100	52·6800

(In actual practice, factories ignore the decimal points and calculate to the nearest pound).

The chart quoted is the one in general use in Queensland and it is based on the assumption that the butter manufactured will contain 14 per cent of water. However the maximum amount of water which butter may contain under the Dairy Produce Acts is 16 per cent and buttermakers frequently produce butters having a water content of 15·5 per cent and higher. It will therefore be readily understood that the quantity of butter actually manufactured usually exceeds the quantity estimated from the chart. This excess is the basis of the over-run.

To ensure that suppliers received payment for all butter made from the cream supplied by them, the law provides that this over-run be distributed to them in proportion to the quantity of commercial butter which the chart indicates can be made from the cream supplied by them.

Factors Affecting Over-run. While the foregoing indicates the basis of over-run, there are other factors which affect it, the most important of which are as follows:—

1. Faulty factory scales and irregularities in weight.
2. Inefficient testing and faulty glassware.
3. Slovenly factory practices
4. Faulty butter composition, low moisture and salt, and loss of salt.
5. Faulty factory equipment.

Amount of Over-run. The principal factors affecting over-run are efficient weighing sampling and testing of the cream and the percentage of water and salt in the finished product although other factors have some influence on it The supplier will naturally be interested in the percentage of over-run which he can expect in normal circumstances. Generally speaking, the over-run should not be more than 3%. If it exceeds 3% the weights and / or the tests of cream recorded are low or the butter is being marketed with more than the percentage of water permitted by law. If it is unduly low or an under run occurs, the weights and / or the tests of cream recorded are high or inefficiency in the factory, is causing losses in manufacture either by actual losses of butter or by marketing butter with a low percentage of water. It must be mentioned however that it is frequently impracticable for a factory which does a considerable trade in fresh cream to show any over-run or if one is shown it will be very low. (Queensland Agrl. Journal, May 1948).

Liquid Manure. To make liquid manure, soak a sugar bag of fresh poultry cow or pig manure for a week in a cask with the head knocked in-one holding 40 to 50 gallons is the most handy. Use the resulting solution at the rate of one part to three parts of fresh water. Fill the cask again, and when the manure has soaked for a week use the solution at the rate of one part to one part of fresh water. The cask may then be filled up a third time, and after the liquid has been allowed to stand for a week it may be used neat.

This form of liquid manure is safe, and if it is applied weekly at the rate of 4 gallons to every 18 feet of a running row no further stimulant is necessary for most growing crops.

Many crops, such as lettuce, cabbage. and silver beet, will be more tender for being forced by applications of liquid manure. (Queensland Agrl. Journal, May 1948)

GLEANINGS.

Agricultural Newsletter, Madras.

Superior Cotton Strain. As a result of the experiments conducted in the various Combodia cotton tracts, it has been observed that strain Co. 4/B. 40 has been consistently outyielding the old strains 920, Co 2 Co. 3. Its early maturing habit helps to reduce the number of irrigations and also allows the planting of the following crop in rotation in proper season. It is resistant to black arm disease. Its quality of lint is superior to the Cambodia strains already under cultivation. It is also suitable for cultivation in the rainfed Cambodia area of Salem, Coimbatore, Madura and Tiruchirapalli districts.

Cotton for Khadi. Trials are underway with a number of exotic perennial cotton types in all the Agricultural Research Stations. One or two types of South American origin are promising. Pruning the plants on the onset of the monsoon will help to control the incidence of pests and diseases.

Co. 5 Cotton. During the last season, when the north-east monsoon rains faild, Co. 5 cotton, an improvement over K 1 (Karunganni), had established its capacity to resist drought. In a trial conducted in a district under restricted irrigation, Co. 5 yielded 1720 lbs., per acre, as against 1050 lbs., of K. 1. Large stocks of Co. 5 seeds are ready for distribution in the coming season.

Blast Disease Combated. Two highly resisatnt strains to blast disease in Samba paddy varieties, viz Co 25 and 26, have been released for cultivation, to replace the long duration varieties like Adt. 10 and 11 of Tanjore, Ramagarudan Samba of South Arcot, Arai Samba of Madura and Nellore Samba of Coimbatore. 15,000 lbs., of seeds have been stocked in the various Agricultural Depots.

More Long Staple Cotton. One simple and sure method, which every cultivator of irrigated cambodia can adopt, to increase nome production of long staple cotton, is to ensure a uniform and close stand in the crop by dibbling the cotton seeds 6" to 9" apart in the line. If, for any reason, sowing is late, dibbling it even closer, say 4½ inches, will be advisable.

Soak the Seed Overnight Those interested in starting wattle plantation on the hills are advised to soak the seed overnight, before sowing in the nursery. This ensures good germination

Form Bunds Here is a piece of good news to farmers in the Ceded District, where low rainfall and crop failures are common. Lay your fields into sub-plots with small bunds with a bund-forming implement, drawn by a pair of bullocks, just before sowing The rains that are received get soaked in the soil itself within the plot, without being run off. This simple culture would cost the former but twelve annas, and in turn, would help to increase the yield of the crop anything from 1/10 to 1/5 of the normal produce, valued at Rs. 3—5—0 to Rs. 6—5—0 at the current price of the produce. Contact the local Firka Maistry to procure you a band-forming implement, and have your fields bunded, before sowing.

Suggestion to Gingelly Growers. Do not sow gingelly either thick or sparse. Adopt judicious thinning to space the crop between 9" to 12" apart, to ensure maximum yield under a given manurial and irrigational treatment

Thorny Hedge. Prospie Jukiflora is a useful plant for raising a thorny hedge. The leaves of the plant are not relished even by goats. 500 bags of pod (20,000) were collected during this year at the Agricultural Research Station, Hagari, and distributed to the different Agricultural Depots for sale to farmers. Get your requirements and necessary instructions from these depots to raise the hedge to prevent cattle trespassing in your fields and gardens.

Seedless Grapes. The cultivation of seedless grapes is at present confined to a few enterprising planters in Madura district and Tiruppur. Arrangements have been made through the courtesy of these planters to collect the prunings from their gardens and raise rooted cuttings in all the Agricultural Research Stations, wherefrom cultivators can obtain their requirements.

Red Ant Pest. The experiment with spraying Gammaxane (0·025 dilution) on Sathgudi trees, infested with red ants, has shown that it can drive away the red ants from fruit trees.

Hint to Citrus Growers. Two sprayings of zinc sulphate, given at an interval of 40 days, completely cured the signs of mottling of leaves, frequently occuring in citrus seedlings.

Manuring Sugarcane. Late application of manure prolongs the vegetative growth, leading to a deterioration in the purity of cane juice and sucrose contents. Avoid this practice and contribute to high recovery of sugar, if you are delivering the canes to a factory. Even if you make your own jaggery, it will also pay you to get a hard-set, good, jaggery, by manuring your sugarcane crop early in the season.

Good News to Cardomom Planters. The quality and yield of cardomom crop have been on the decline for some years past and research scheme is in operation on the Singampatti and Anamalai Hills, financed by the Imperial Council of Agricultural Research, to find ways and means to improve the quality of produce and yield. Experiments so far done have shown that monthly dusting of gammaxane against thrips control the pest and contribute to increase the yield and prevent scabbing of the pods. The treated plots have recorded an yield of 123 lbs., as compared with the low yield of 31 lbs., from the untreated plots. At the present market price, the treatment results in a net profit of Rs. 310—7—0 per acre for an expenditure of Rs. 33—12—0 on the treatment.

Short Courses in Veterinary and Livestock. The Government have introduced from the current year a shorter course of studies in Veterinary and Livestock subjects known as "Veterinary and Livestock Inspectors course" with a view to make veterinary aid to reach the interior villages, as soon as possible. The new course is of 2 years duration and requires an entrance qualification of a completed S. S. L. C. with Science as optional subject Students admitted are to receive a stipend of Rs. 25 per month.

Artificial Insemination. Artificial insemination was adopted in the case of about a hundred cows received for service in the College. The object of this is to conserve the use of the sperm from very valuable bulls and use it for more than one cow Such a course cannot be adopted when cows are served by the bulls in the ordinary way A scheme for an intensive programme of artificial insemination of cows has been prepared with a view to produce a larger number of improved type of cattle. It is hoped that this measure will quicken the output of first-rate breeding bulls, now badly needed by the Province. Artificial insemination of cows is now done free of cost in the Veterinary College and owners of cows in heat with in easy distance of the College may avail themselves of the opportunity. [Issued by the Director of information & Publicity Government of Madras].

Agricultural Research Institute Library, Lawley Road.
List of Additions for September, 1948.

1. Association of British Insecticide Manufacturers' Directory, 1948.
2. ASMOUS'S: Bibliography of Russian Botany.
3. CRANE (M. B.) and LAWRENCE (W. J. C.): Genetics of Garden Plants 1947.
4. CULPIN (C) Farm Machinery, 1946.
5. CHESTER (K. Starr): Nature and prevention of cereal rusts as examplified in the leaf rust of wheat, 1946.
6. ELSENBERG (James): Commercial Art of Show Card lettering, 1946.
7. HERKIMER (Herbert) and HERKIMER (Harold)· Air Conditioning, 1947.
8. HOPKINS (R. H.) and KRAUSE (B.) Biochemistry applied to malting and brewing, 1947.
9. INDIAN SUGAR SYNDICATE LTD., KANPUR (INDIA): Indian Sugar Supplement, 1948
10. KIRCHENRAUER (H. G.)· Fats and Oils—an outline of their Chemistry and Technology, 1944.
11. MADRAS SOIL EROSION TEXT BOOK, Editorial Committee, Soil Erosion: its prevention and control
12. MITCHELL (R. L.). Spectrographic analysis of soils, plants and related materials, 1948. Commonwealth Agricultural Bureaux, Technical Communication No. 44)
13. PINCUS (Gregory): Recent progress in Hormonechemistry, 1947.
14. SHREVE (R. Norris): Chemical Process Industries. Edn. 1. 1945
15. TAUBER (Henry) Enzyme Technology, 1946.
16. THOMAS (Meirion). Plant Physiology, 1947.
17. WHITTING (PERCY H.)· Five great rules of selling, 1947.

Crop and Trade Reports

Statistics — Crop — Sugarcane — 1948 — Intermediate condition report: The condition of the sugarcane crop is reported to be generally satisfactory in all the districts except Chingleput, North Arcot and Salem where the crop is stated to have been affected to some extent by adverse seasonal conditions and inadequate supply of water in irrigation sources. In Guntur district the crop is reported to have been effected by white ant pest in a few places. The wholesale price of jaggery per imperial maund of 82-2/7 lb (equivalent to 3,200 tolas) is Rs. 16—3—0 in Erode, Rs. 14—0—0 in Adoni, Rs. 13—11—0 in Vizagapatam, Rs 13—4—0 in Coimbatore, Rs. 12—8—0 in Salem, Rs. 11—8—0 in Rajahmundry, Rs. 10—14—0 in Tiruchirapalli, Rs 10—11—0 in Cocanada, Cuddalore and Vellore, Rs. 9—2—0 in Vizianagaram and Rs. 8—4—0 in Chittoor.

(From· Economic Adviser).

Raw cotton in the Madras Province. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1948 to 24th September 1948 amounted to 324,669 bales of 400 lb. lint. The receipts in the corresponding period of the previous year were 285,049 bales. 353,848 bales mainly of pressed cotton were received at spinning mills and 29,622 bales were exported by sea while 76,283 bales were imported by sea mainly from Karachi and Bombay.

(From the Director of Agriculture, Madras)

Weather Review—For September, 1948.

RAINFALL DATA.

Division	Station	Actual for month in inches	Departure from normal in inches	Total since January 1st in inches	Division	Station	Actual for month in inches	Departure from normal in inches	Total since January 1st in inches
Orissa & Circars.	Gopalpore,				South.	Negapatam	1·4	−1·9	13·4
	Calingapatam	8·2	+1·3	27·0		Aduturai*	1·7	−2·3	8·5
	Vizagapatam	6·9	+0·4	17·8		Pattukottai*	0·5	−4·1	12·5
	Anakapalle*	10·3	+2·3	24·1		Madura	3·7	−1·0	16·0
	Samalkota*	9·0	+3·1	22·6		Pamban	0·0	−1·1	4·3
	Cocanada	8·8	+2·6	29·5		Koilpatti*	0·6	−2·3	17·2
	Maruteru*	7·8	+1·9	21·8		Palamkottah	...	...	...
	Masulipatam	6·2	−0·2	18·1		Amba-samudram*	0·1	−1·1	13·3
	Guntur*	3·8	−1·3	17·5					
	Agri College, Bapatla	5·7	−1·9	19·4	West Coast.	Trivandrum	2·0	−2·5	52·9
	Veeravanam, College Farm.	4·9	..	22·9		Cochin	5·1	−2·6	100·2
						Calicut	9·4	...	110·6
Ceded Dists.						Pattambi*	4·4	+0·4	82·7
	Kurnool	5·2	−0·8	16·7		Talliparamba*	...	...	..
	Nandyal*	3·8	−2·9	22·7		Nileshwar*	7·4	−1·3	132·0
	Hagari*	7·7	+3·2	16·5		Pilicode*	7·0	−2·8§	131·6
	Siruguppa*	6·0	−0·3‡	15·7		Mangalore	11·5	+2·1	110·9
	Bellary	3·8	−1·1	15·7		Kankanady*	10·9	+1·6	111·0
	Rentichintala	9·0	.	23·3					
	Cuddapah	4·7	−1·3	16·4	Mysore & Coorg.	Chitaldrug	0·3	−4·1	23·2
	Anantharajpet*	2·9	−0·4§	14·6		Bangalore	2·6	−4·1	32·4
Carnatic.	Nellore	1·3	−3·2	11·3		Mysore	3·2	−1·8	25·9
	Buchireddi-palam*	2·1	−1·5	12·5					
	Madras	4·1	−0·6	14·6	Hills.	Mercara	16·2	+5·1	128·7
	Tirurkuppam*	6·1	+0·3§	17·7		Kodaikanal	3·9	−3·4	39·8
	Palur*	13·0	+6·1	30·6		Coonoor*	1·7	−2·6	25·9
	Tindivanam*	6·3	−0·0	14·5		Ootacamund*	...	...	..
	Cuddalore	7·6	+2·4	20·3		Nanjanad*	3·4	−1·5	55·8
Central.	Vellore	5·6	−1·3	15·8					
	Gudiyattam*	3·2	−4·0	16·3					
	Salem	2·5	−3·6	20·7					
	Coimbatore (A.C.R.I.)*	0·0	−1·4	11·6					
	Coimbatore (C.B.S.)*	0·0	−1·8	12·7					
	Coimbatore	0·8	−0·8	10·0					
	Tiruchirapalli	3·3	−0·7	15·3					

Note:— (1) * Meteorological Stations of the Madras Agricultural Department.

(2) Average of ten years data is taken as the normal.

(3) § Average of five years in Tirurkuppam, and Anantharajpet and six years in Pilicode.

(4) ‡ Taluk office rainfall being 6·16.

(5) ... Figures not available.

Weather Review for September, 1948.

The month began with a unsettled condition in the Bay of Bengal on the northern side. It developed into a shallow depression over Eastern Pakistan and the adjoining parts of Gangetic West Bengal which remained over this region for two days. After remaining over the north-west Central Provinces and the neighbourhood for another two days, it ended as an unimportant diffuse 'low' pressure over East Rajputana and adjoining parts of West Central India.

On the ninth day of the month the weather was unsettled in the Bay of Bengal close to West Bengal and North Orissa coasts. The unsettled conditions in the Bay of Bengal passed inland the next day as a low pressure wave.

On 17—9—1948 conditions were unsettled in the Central Bay of Bengal and neighbourhood which on the next day extended as a trough of low pressure from Orissa-Circars to Arabian coast On the 19th, it concentrated to depression centred at 150 miles East of Vizagapatam which moved west-northwards and centred at 30 miles south-east of Calingapatam on the 20th September, and weakened to a trough of low pressure near Orissa coast This crossed the Hyderabad State rapidly and emerged into the Arabian sea off Konkan and concentrated to a deep depression on the 23rd September, and intensified to a cyclonic storm 150 miles west-northwards of Bombay on the 24th and intensified on the 25th to a severe cyclonic storm near Dwaraka and then weakened and lay as a trough of low pressure along Sind-Kathiawar coast.

On the 24th, unsettled conditions were again noted in the North Bay which became marked on the 26th and lay as a trough of low pressure off Orissa Circars coast On the 28th, it concentrated into a depression centred at 18°N. 86½°E. and weakened on the next day and lay as a trough of low pressure over Orissa-Chotta Nagpur.

Rains:— Under the influence of the depression in the Bay of Bengal the monsoon strengthened in the Konkan and the Central parts of the country where widespread and local rains occurred on 4—9—1948. Periodic rains varying in nature from widespread to moderate and light were received in many parts along the West Coast and in Tamilnad, Andhradesa and Rayalaseema. In short, the monsoonic activities were practically dull throughout the month under report, and the shortage delayed, the transplanting of Samba in the Chingleput and South Arcot districts, and the dry cotton sowings in the red soil area in general. The noteworthy falls are detailed below:—

Serial No.	Place.	Date.	Rainfall in inches.
1.	Mangalore	6—9—48	2·0
2.	Masulipatam	10—8—48	3·7
3.	Kallakurichi	11—9—48	2·3
4.	Nungambakkam	14—9—48	2·7
5.	Ongole	15—9—48	3·3
6.	Cuddalore	15—9—48	3·2
7.	Cuddapah	15—9—48	3·6
8.	Rentichintala	24—9—48	2·4

Departmental Notifications

GAZETTED SERVICE—POSTING AND TRANSFERS

Name of Officers	From	To
Sri Bhushanam, K.	On leave,	D. A. O., Ellore.
,, Muthuswami Iyer, T. G.	D. A. O., Madura,	Regional Dy. D. A., Madras.
,, Nataraj, T.	On leave,	J. L. A., Bapatla.
,, Ramasubba Iyer, A. K.	On leave,	D. A. O., Madura.
,, Satyanarayana, M.	D. A. O., Ellore,	D. A. O., Madras
,, Sankaran Nambiar, M. P.	A. M. O., Coimbatore,	Dy D. A. O., Coimbatore.
,, Subramania Pillai, M.	D A. O , (on leave),	D A. O., Nellore.
,, Subramania Sarma. A. H.	On leave,	A. M O., Coimbatore.

SUBORDINATE SERVICE

POSTING AND TRANSFERS

Name of Officers	From	To
Sri Annaswami, A. K.	A. D., Dharapuram,	A. D., Koilpatti
,, Achuthan Nambiar, K.	On leave,	F. M., Wynad.
,, Appa Rao, S.	A. D , Tadepalligudam,	A. D , Allagadda
,, Bhabu Rao, G.	Entomology Asst. Coimbatore,	Paddy Asst. A. R S., Taliparamba.
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